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ENVIRONMENTAL ASSESSMENT OF THE REALIGNMENT OF UNITS AT KIRTLAND AIR FORCE BASE, NEW MEXICO

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ABBREVIATIONS AND ACRONYMS

AAMRL	Armstrong Aerospace Medical Research Laboratory
ABW	Air Base Wing
AFB	Air Force Base
AFISC	Air Force Inspection and Safety Center
AFRES	Air Force Reserves
ANL	Argonne National Laboratory
AQCR	Air Quality Control Region
ARTS	Air Reserve technicians
BAI	backup aircraft inventory
Bldg.	building
BOS	base operating support
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
Co.	company
dB	decibels
DOD	Department of Defense
DPDO	Defense Property Disposal Office
EA	environmental assessment
EIS	environmental impact statement
EPA	Environmental Protection Agency
FICUN	Federal Interagency Committee on Urban Noise
Fig.	figure
ft	feet
ft^2	square feet
FY	fiscal year
gal	gallons
HA	highly annoyed
HC	hydrocarbons
Inc.	incorporated
J.	journal
JP-4	jet fuel
km	kilometers
L_{dn}	day/night average sound level
MAC	Military Airlift Command
mi	miles
$\mu g/m^3$	micrograms per cubic meter
mg/m^3	milligrams per cubic meter
m/s	meters per second
NEPA	National Environmental Policy Act of 1969
N.M.	New Mexico
NO_x	nitrogen oxides
NP[illegible]	National Register of Historic Places
O_3	ozone
PAA	Primary aircraft authorized

PM_{10}	particulate matter, particles with a diameter of less than 10 micrometers
POL	petroleum, oil, and lubricants
ppm	parts per million
Sec.	Section
SEL	sound exposure level
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
TAC	Tactical Air Command
TSP	total suspended particulates
U.S.	United States
USAF	U.S. Air Force
yd^2	square yards

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SUMMARY

It is proposed that the Air Force Inspection and Safety Center (AFSIC) be transferred from Norton Air Force Base (AFB) in California to Kirtland AFB in Albuquerque, New Mexico. Within the same time frame, seven H-53 helicopters would be replaced with four MH-53J and four CH-53A helicopters, four H-3 helicopters would be replaced with five MH-60G helicopters, and three MC-130H aircraft would bed down at Kirtland AFB. Some facility construction and modification projects would be associated with these changes. This environmental assessment evaluates the potential environmental impacts of the proposed action.

Noise modeling indicates that the changes in helicopters and the beddown of the MC-130H would cause only minor changes in the noise contours in the vicinity of Kirtland AFB. Aircraft emissions of all five criteria air pollutants would increase, but increases in the ambient pollutant levels at the base boundary are projected to be small, and concentrations would be well within air quality standards.

No deterioration in the quality of the land, groundwater, or surface water resources would result from the proposed action. Small areas of vegetation would be removed by activities associated with the construction projects, but this removal would not jeopardize the ecological resources of the area, including any threatened or endangered species. No effects are expected on known archeological sites or historical resources.

A 4% increase in military and civilian personnel on the base, along with their families, would occur as a result of implementation of the proposed realignment and other basing changes. Utilities, however, are adequate to support this increase.

Although some minor impacts would occur during facility construction and modification activities associated with the proposed action, no federal, state, or local laws or requirements imposed for the protection of the environment are expected to be violated, and no major adverse environmental impacts are expected.

1 INTRODUCTION

1.1 SCOPE AND PURPOSE OF THE PROPOSED ACTION

On May 3, 1988, the Secretary of Defense chartered a special commission with the task of evaluating military installations and recommending changes to increase efficiency and reduce overall costs. The Commission, which completed its work in December 1988, reviewed current and planned military base structure and established criteria for realigning and closing installations. The Commission recommended closure of 86 bases, including Norton Air Force Base (AFB) in California.

One of the recommendations was for the realignment of units from Norton to March AFB, Travis AFB, and McClellan AFB in California; McChord AFB in Washington; and Kirtland AFB in New Mexico. This environmental assessment (EA) evaluates the proposed unit realignment to Kirtland AFB. Additional EAs will be prepared for the other realignments mentioned above, and two environmental impact statements (EISs) will be prepared -- one to analyze the impacts caused by the withdrawal of units from Norton AFB and one to assess the disposal of properties at Norton AFB.

In addition to the realignment actions at Kirtland AFB related to withdrawal of units from Norton AFB, this assessment will evaluate other basing changes projected for Kirtland.

1.2 SUMMARY OF ENVIRONMENTAL-STUDY REQUIREMENTS

Under the National Environmental Policy Act of 1969 (NEPA), federal agencies are required to take the environmental consequences of proposed actions into consideration in the decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. To this end, the CEQ has issued Regulations for

Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500-1508). The CEQ regulations specify that an environmental assessment serves to:

- Provide brief discussions of the need for the proposed action and discussions of impacts associated with the proposed action and alternatives.
- Briefly provide evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact;
- Aid in an agency's compliance with the Act (NEPA) when no environmental impact statement is necessary; and
- Facilitate preparation of a statement when one is necessary.

To comply with NEPA and to assess impacts on the environment, the decision-making process for the proposed realignment includes a study of the environmental issues related to the proposed action, including those issues related to construction of new facilities and modification of existing buildings at Kirtland AFB.

The Base Realignment and Closure Act (Public Law 100-526) makes the following changes to the normal process that the U.S. Air Force (USAF) follows to comply with NEPA and the regulations put forward by the CEQ:

- The EA will not consider the need, purpose, or reason for the realignment, and
- The EA will not consider alternative locations for the realigned unit.

These two considerations are not applicable, however, to those additional basing changes at Kirtland AFB that are not related to the realignment.

2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 RECOMMENDED CHANGES RESULTING FROM THE REALIGNMENT

As a result of the closure of Norton AFB, the Air Force Inspection and Safety Center (AFISC) will be transferred to Kirtland AFB, beginning the fourth quarter of FY 1991. The mission of the AFISC is to assess the USAF's fighting capability and resource management effectiveness. The center performs its mission by:

- Evaluating how effectively and efficiently leadership and management systems work,
- Developing and managing the USAF Mishap Prevention Program, and
- Suggesting better ways for the USAF to perform wartime and peacetime missions.

The AFISC consists of the Directorate of Inspection, Directorate of Aerospace Safety, Directorate of Medical Inspection, and Directorate of Nuclear Surety. The first three directorates currently are based at Norton AFB, and the last one is already based at Kirtland AFB. Under the proposed realignment, all would be based at Kirtland.

About 346 military and 138 civilian personnel would be relocated, and it would be necessary either to construct a new facility or modify an existing building at Kirtland AFB to house the AFISC. In addition, 30 open acres would be required for use as a crash-site laboratory, where aircraft wreckage would be scattered for use in training AFISC personnel how to determine the cause of crashes. The estimated cost for this relocation and associated construction is $8 million.

2.2 OTHER BASING CHANGES PROPOSED FOR KIRTLAND

In addition to the changes resulting from the realignment of the AFISC from Norton, other changes expected to occur within the same time frame are evaluated in this EA. The other basing changes are as follows:

- Move seven H-53 helicopters from Kirtland and replace them with four MH-53J and four CH-53A helicopters. Eight additional military personnel would be required, but there would be no change in the number of flying hours.
- Move the four primary aircraft authorized (PAA) H-3 helicopters and replace them with five MH-60G helicopters, along with their support equipment. An additional 63 military and 2 civilian personnel would be required, but again there would be no change in the number of flying hours.
- Bed down three MC-130H aircraft at Kirtland. This would require 288 military and 1 civilian personnel. This change would increase flying time of assigned aircraft by 1,280 hours in FY 1991, 2,560 hours in FY 1992, and 1,920 hours in FY 1993 and FY 1994. This action would require alterations to Hangar 1001, additions to an avionics shop, and construction of a new MC-130 simulator facility and a field training detachment facility. The estimated cost for these construction and renovation activities is $11.25 million.

2.3 ALTERNATIVES TO THE PROPOSED ACTION

2.3.1 Alternatives to the Realignment

As stated in Sec. 1.1, the Base Closure and Realignment Act exempts this EA from considering alternative locations for the realigned unit (the AFISC). The description of the affected environment presents the existing conditions associated with the installation, and those same conditions would prevail under the no-action alternative.

2.3.2 Alternatives to the Additional Basing Changes

Alternative Locations

Other bases were considered as locations for the MH-53J, CH-53A, and MH-60G helicopters and for the HM-130H aircraft. However, the other bases considered are either saturated or their training environments are less effective. In addition, only Kirtland has formal school expertise for the MH-60G. Therefore, these alternatives were rejected.

No-Action Alternative

Adoption of the no-action alternative for the other basing changes would mean that the H-53 and H-3 helicopters would remain at Kirtland AFB, and the MH-53J and CH-53A helicopters and the MC-130H aircraft would not bed down at Norton. The funding for the H-3 helicopters is scheduled to end Oct. 1, 1989. It is not known where additional funding for the H-3 would be obtained.

The CH-53A helicopters for first training and the MH-53J helicopters for mission qualification training would not be utilized at Kirtland, and such training would have to be eliminated, as would upgraded training for the MC-130H aircraft. Finally, formal schooling for initial training requirements for the MH-60 helicopters would have to be conducted elsewhere, thus overloading operational units.

2.4 ENVIRONMENTAL CONSEQUENCES

2.4.1 Proposed Action

Implementation of the proposed actions would result in a 4% increase in permanent staff at Kirtland AFB. Temporary employment would be required for the various construction and alteration projects associated with the proposed action.

Calculations show that emissions of all five criteria air pollutants would increase with the proposed basing changes. Increases in ambient pollutant levels at the base boundary, however, are projected to be small, and the concentrations would be well within air quality standards. Construction activities would cause a short-term increase in fugitive dust emissions.

Additional C-130 operations would have an infinitesimal impact on the noise contours. Changes in the helicopter models and operations would only cause a moderate expansion of the already-small noise contours at the auxiliary field. However, this expansion of contours at the auxiliary field would not involve any residential areas or other noise-sensitive locations. Single-event noise levels at the eight sensitive receptors for the C-130 and the helicopters (represented by the H-53) are much smaller than those produced by the A-7D and 727-200 aircraft.

Construction associated with the conversion would generate routine volumes of nonhazardous wastes that would be removed as specified in construction contracts. Operations involving hazardous materials would be carried out in accordance with appropriate state and federal regulations and Air Force directives and are not expected to result in adverse impacts. The city sewage treatment facilities and water supply are more than adequate to handle the increase in personnel and their families.

Minimal impacts are expected in the following areas: groundwater quality, vegetation and wildlife resources, socioeconomic factors. No impacts are expected to threatened and endangered species, cultural resources, or land use compatibility.

2.4.2 No-Action Alternative

If the proposed realignment and other basing changes are not implemented, the present mission and current operations at Kirtland AFB would remain unchanged, and no new perturbations would occur to the environment around the base. It is not known where the funding for continued operation of the H-3 helicopters would be obtained.

3 AFFECTED ENVIRONMENT

3.1 PHYSICAL AND DEMOGRAPHIC SETTING

Kirtland AFB is located in central New Mexico, adjacent to the southeastern city limits of Albuquerque (Fig. 3.1). Albuquerque, located in Bernalillo County, had a 1980 population of 331,767. U.S. Highway 66 is less than a mile north of the base, Interstate 40 (I-40) is 1-3/4 mi north, and I-25 is 1-1/2 mi to the west.

Kirtland is located at the foot of the Manzano Mountains to the east and adjacent to the Isleta Pueblo Indian Reservation on the south. Residential areas are to the north, and business and residential properties to the west. The westernmost portion of the base is adjacent to Albuquerque International Airport.

The primary mission of Kirtland AFB is that of the 1606th Air Base Wing (ABW), which provides technical facilities, procurement, and logistic support for many research and development programs. More than 30 tenant units or facilities are located at Kirtland, including the Air Force Weapons Laboratory; the 1550th Combat Crew Training Wing; Sandia National Laboratory; Lovelace Biomedical and Environmental Institute; the Air Force Contract Management Division; the Air Force Operational and Test Evaluation Center; the New Mexico Air National Guard; the 3098th Aviation Depot Squadron; the Field Command, Defense Nuclear Agency; the Department of Energy; the Air Force Office of Security Police; the Naval Weapons Evaluation Center; the Directorate of Nuclear Surety; the Interservice Nuclear Weapons School; and the Air Force Space Technology Center.

Eight runways, all on the Albuquerque International Airport are used by Kirtland AFB. The primary runway (Runway 8/26) is 13,375 ft long and 300 ft wide. The next most utilized runway (Runway 17/35) is 10,010 ft long and 150 ft wide. All scheduled MAC, ANG, and civil scheduled flights use these runways. The other four runways (3/21

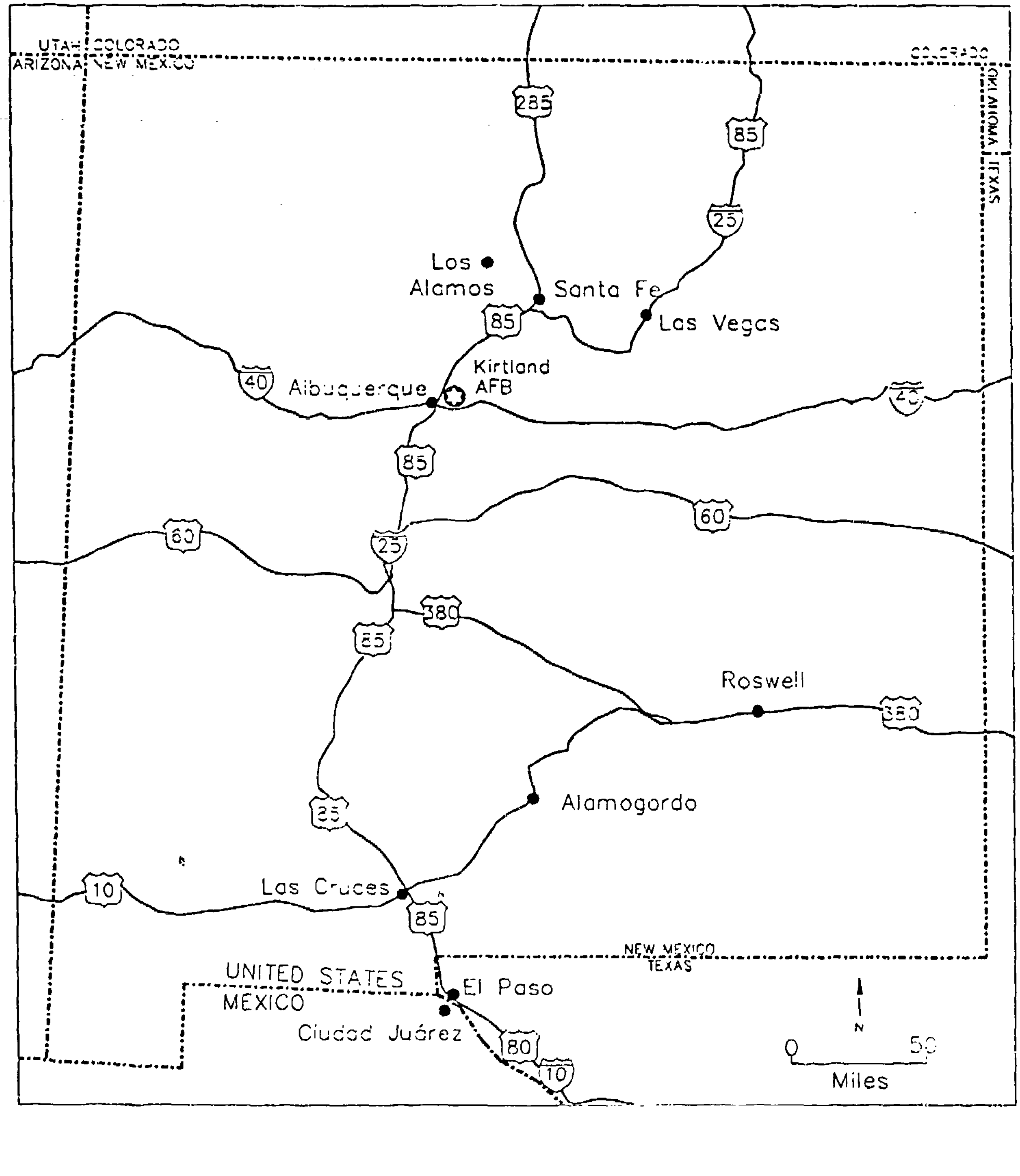

FIGURE 3.1 Map of New Mexico Showing Locations of Albuquerque and Kirtland AFB

and 12/30) are used sparingly. An auxiliary field used for military helicopter operations is located in the southwestern corner of the base (Fig. 3.2).

Kirtland AFB occupies an area of 52,450 acres, of which 18,302 acres are National Forest land withdrawn for USAF use and 4,595 acres are National Forest land withdrawn for Department of Energy (DOE) use. More than 750 buildings are located on site (Fig. 3.2).

3.2 ENVIRONMENTAL SETTING

3.2.1 Air Quality

Kirtland AFB and Albuquerque are within Air Quality Control Region No. 2 (AQCR-2), one of eight AQCRs in the state. Air quality control functions for all of Bernalillo County have been delegated to the Albuquerque-Bernalillo County Air Quality Control Board.

New Mexico state air quality standards and federal primary and secondary standards are listed in Table 3.1. National primary ambient air quality standards define levels of air quality that are necessary, with an adequate margin of safety, to protect the public health. National secondary standards define levels of air quality that are deemed necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Welfare, in this context, relates to damage to buildings, plants, and animals, as well as impairment of visibility.

The Albuquerque metropolitan area is situated in a river valley that is bounded by a high plateau on the west and an even higher mountain range on the east. The valley is protected from passing storms and general (synoptic) wind-flow patterns. However, this protection also reduces much-needed ventilation of the area's air mass. The resulting accumulation of various forms of pollutants cause unhealthful conditions to occur during certain times of the year (New Mexico Health and Environment Department 1985).

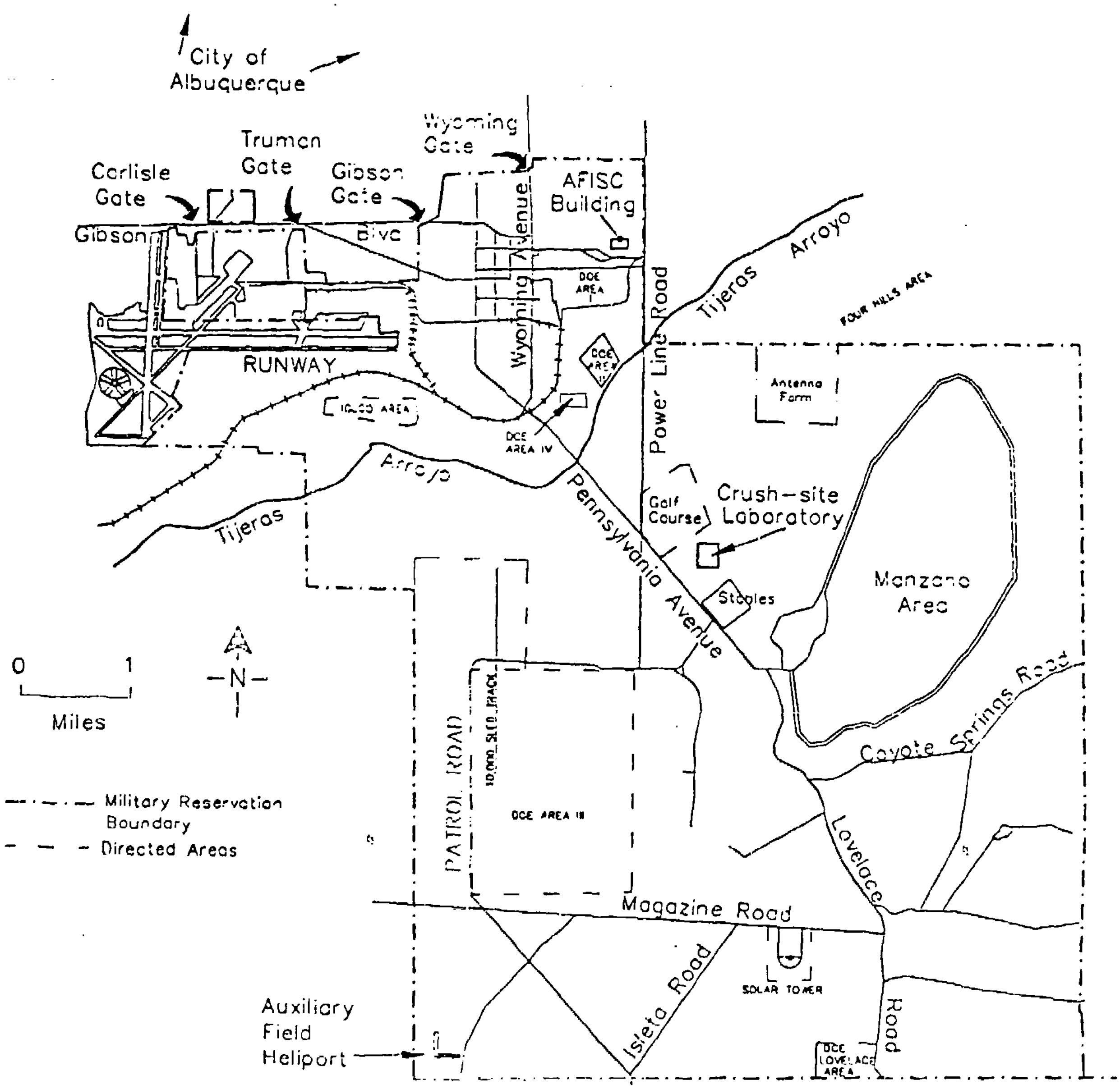

FIGURE 3.2 Layout of Kirtland AFB

TABLE 3.1 State And Federal Air Quality Standards And Ambient Values Near Kirtland AFB

Pollutant	State Standard	Federal Standard Primary	Federal Standard Secondary	Ambient Values[a]
Carbon monoxide (mg/m^3)				
8-hour average	9.9	10	10	8.1[b]
1-hour average	15.0	40	40	14.9[b]
Nitrogen oxides ($\mu g/m^3$)				
24-hour average	200	-[c]	-	N/A[d]
Annual arithmetic mean	100	100	100	N/A
Ozone ($\mu g/m^3$)				
1-hour average	118	235	235	198[e]
Total suspended particulates ($\mu g/m^3$)				
24-hour average	150	260	150	112.0[e]
Annual geometric mean	60	75	60	50.7[e]
PM_{10} ($\mu g/m^3$)				
24-hour average	N/A	150	150	N/A
Annual arithmetic mean	N/A	50	50	N/A
Sulfur dioxide ($\mu g/m^3$)				
24-hour average	260	365	-	N/A
Annual arithmetic mean	53	80	-	N/A
3-hour average	-	-	1,300	N/A

[a] Best estimate of ambient values in Kirtland AFB vicinity.

[b] Monitoring station at 2421 Mesilla St. N.E.

[c] No standard set.

[d] N/A = Not available.

[e] Monitoring station at 600 Anderson St. N.E.

To add to this occasional lack of ventilation, the area is arid, receiving an annual average of only 8 in. of precipitation. The dry conditions result in poor soil stabilization, thus increasing dust from agriculture, streets, and roads. Each vehicle fans the dust on the roads and streets and causes reentrainment of particles into the air. Many of the particles so small that it may take hours, or even days, for them to settle back to the ground.

Because strong temperature inversions that form over the valley (especially in the winter) trap air pollutants, federal air quality standards, especially those for carbon monoxide (CO), are frequently exceeded. It is particularly a problem from an environmental standpoint that the temperature inversion begins forming about sundown and intensifies very early in the evening. This results in trapping of the pollutants generated by the afternoon rush-hour and evening shopping traffic, as well as those generated by burning of wood in residential fireplaces and stoves.

Although Albuquerque is New Mexico's most polluted major city (New Mexico Health and Environment Department 1985), it is rather unique in that less than 3% of the city's pollution burden can be related to the direct emissions of industrial point sources. For the most part, local manufacturers have clean processes, such as electronics assembly, clothing fabrication, and light industrial activities, with few emissions from polluting smokestacks. The principal causes for violations of air quality standards in the city are the use of the automobile and the seasonal use of wood-burning stoves and fireplaces.

Emissions from activities at the Albuquerque International Airport and Kirtland AFB are not considered major sources of air pollutants by the Albuquerque-Bernalillo County Air Quality Control Board (Walker 1989). Hydrocarbon (HC), CO, and volatile organic carbon (VOC) emissions from Kirtland AFB do contribute to the ozone (O_3) concentrations in the area, but those emissions are not major contributors (Conley 1989).

Albuquerque is a nonattainment area (an area not meeting air quality standards) for CO (Conley 1989), but the CO emissions from Kirtland AFB are not major contributors to this problem. The City of Albuquerque has a monitoring station near the base (situated in the southeastern part of Albuquerque) that is representative of the the general airport vicinity. Data from that monitoring station (see Table 3.1) indicate no violation of CO standards, even though the entire county is considered nonattainment with respect to CO. Carbon monoxide violations are generally found in the downtown area of Albuquerque because of the large volume of automobile emissions there.

The city is just within the federal standard for O_3, with the highest readings being found in the next county to the north (as a result of atmospheric transport and chemical transformations) in the summer months. Although the nearest monitoring station to the base shows compliance with federal O_3 standards, the state standards have been exceeded. Regardless, the Albuquerque area is currently considered in attainment with respect to O_3 standards. Concentrations of particulate matter of an aerodynamic diameter of less than or equal to 10 μm (PM_{10}) are within standards.

The 1988 ambient air quality data for the Kirtland AFB area are compared with applicable standards in Table 3.1. Based on discussions with the Albuquerque Air Pollution Control Agency (Conley 1989), the ambient data presented in the last column of the table were from the closest monitor to the base (at 600 Anderson Street SE, about half a mile from the base) or from the next closest monitor (2421 Mesilla Street NE) when data were not measured at the Anderson Street monitor. No data are available for ambient levels of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) because there are no significant sources of those pollutants in the city.

3.2.2 Noise

Noise from jet aircraft operations has received national attention for many years because the relatively great acoustic power generated by jets can cause various stressful effects on residents of communities near airports and military airfields. These effects can include sleep interference, speech interference, startle, and other forms of irritation. Major sources of aircraft noise at Kirtland AFB include operations of the assigned aircraft (A-7D, C-130, F-18, and military helicopters) and ground run-up operations, along with a considerable number of transient aircraft flights. The 1550th Aircrew Training and Testing Wing of the MAC uses C-130 aircraft and military helicopters (UH-1, H-3, and H-53). The 150th Tactical Fighter Group of the New Mexico Air National Guard uses A-7D and C-130 aircraft. The Navy (through the Naval Weapons Evaluation Facility at the base) flies A-7D and F-18 assigned aircraft. Flights of the U.S. Customs Service, the Civil Air Patrol, and the Aero Club represent smaller sources of aircraft noise.

Frequency of Aircraft Operations

Table 3.2 summarizes current aircraft operations at Albuquerque International Airport, including both civil and military operations. Most of the operations involve civil aircraft and military helicopters. However, a significant number of operations involve military transients and the A-7D aircraft. Most of the flights by military fixed-wing aircraft are made to the south of the runways over the military reservation. As shown in Table 3.2, some flights occur during the nighttime (defined as the period from 10 p.m. to 7 a.m.). Some nighttime flights are made by the civil aircraft, some of the transient military aircraft, and the C-130 aircraft. No nighttime flights are made by the A-7D (ANG or Navy) or F-18 aircraft. For purposes of noise impact assessment, each nighttime flight counts as ten daytime flights using the L_{dn} noise modeling methodology discussed below.

The list of transient aircraft included in Table 3.2 was obtained from the log of the base's Transient Alert Facility for September 1, 1988, through February 28, 1989.

TABLE 3.2 Existing Average Daily Aircraft Operations at Albuquerque International Airport

Aircraft	Departures	Arrivals	Closed Patterns	Total Takeoffs	Total Landings	Total Operations
Scheduled Fixed Wing						
Military Air Command (C-130)	1.5/1.5[a]	1.0/2.0	0/0	1.5/1.5	1.0/2.0	2.5/3.5
Air National Guard						
A-7D	26.0417/0	26.0417/0	0/0	26.0417/0	26.0417/0	52.0834/0
C-130	0.3/0.075	0.275/0.10	0/0	0.3/0.075	0.275/0.10	0.575/0.175
Total						52.6/0.175
Navy						
A-7D	4/0	4/0	0/0	4/0	4/0	8/0
F-18	2/0	2/0	0/0	2/0	2/0	4/0
Piper Cheyenne	2/0	2/0	0/0	2/0	2/0	4/0
Total						16/0
Transient Fixed Wing						
A-4	1.0387/0.0055	1.0442/0	11.4286/0	12.467/0.0055	12.4728/0	24.9/0.006
A-6	0.1381/0	0.1381/0	0/0	0.1381/0	0.1381/0	0.2762/0
A-7	0.6464/0.0055	0.6519/0	11.4286/0	12.075/0.0055	12.0805/0	24.2/0.006
A-10A	1.011/0	1.0/0.011	0/0	1.011/0	1.0/0.011	2.01/0.011
F-4	1.8785/0	1.8785/0	0/0	1.8785/0	1.8785/0	3.75/0
F-5	0.0663/0	0.0663/0	0/0	0.0663/0	0.0663/0	0.1326/0
F-14	0.4033/0.0055	0.4088/0	11.4286/0	11.8319/0.005	11.8374/0	23.7/0.005
F-15	0/0	0/0	11.4286/0	11.4286/0	11.4286/0	22.8572/0
F-16	0.4309/0	0.4309/0	11.4286/0	11.8595/0	11.8595/0	23.719/0
F-18	1.1989/0.0055	1.2044/0	0/0	1.1989/0.0055	1.2044/0	2.40/0.006
F-160	0.0055/0	0.0055/0	0/0	0.0055/0	0.0055/0	0.011/0

TABLE 3.2 (Cont'd)

Aircraft	Departures	Arrivals	Closed Patterns	Total Takeoffs	Total Landings	Total Operations
Transient Fixed Wing (Cont'd)						
F-111	0.1492/0	0.1492/0	0/0	0.1492/0	0.1492/0	0.2984/0
P-3	0.1050/0	0.1050/0	0/0	0.1050/0	0.1050/0	0.21/0
T-2	0.1436/0	0.1436/0	0/0	0.1436/0	0.1436/0	0.2892/0
T-33	0.0166/0	0.0166/0	0/0	0.0166/0	0.0166/0	0.0332/0
T-34	0.4088/0	0.4088/0	0/0	0.4088/0	0.4088/0	0.8176/0
T-37	1.9282/0	1.9171/0.011	11.4286/0	13.3568/0	13.3457/0.011	26.7/0.011
T-38	4.6519/0.0166	4.6685/0	11.4276/0	16.081/0.0166	16.0971/0	32.2/0.017
T-39	0.1381/0	0.1381/0	0/0	0.1381/0	0.1381/0	0.2762/0
OV-10	0.1823/0	0.1823/0	0/0	0.1823/0	0.1823/0	0.3646/0
U-21	0.4917/0.0055	0.4917/0.0055	0/0	0.4917/0.0055	0.4917/0.0055	0.983/0.011
KC-135	0.1050/0	0.1050/0	0/0	0.1050/0	0.1050/0	0.21/0
C-5	0.0442/0.0055	0.0497/0	0/0	0.0442/0.0055	0.0497/0	0.094/0.006
C-9	0.5138/0.0055	0.5193/0	0/0	0.5138/0.0055	0.5193/0	1.03/0.006
C-12	0.8729/0.0055	0.8729/0.0055	0/0	0.8729/0.0055	0.8729/0.0055	1.75/0.011
C-21	1.1270/0.1160	1.1767/0.0663	0/0	1.1270/0.1160	1.1767/0.0063	2.30/0.182
C-130	1.0497/0.011	1.0331/0.276	0/0	1.0497/0.011	1.0331/0.0276	2.08/0.039
C-131	0.0331/0	0.0331/0	0/0	0.0331/0	0.0331/0	0.0662/0
C-140	0.0166/0	0.0166/0	0/0	0.0166/0	0.0166/0	0.332/0
C-141	0.5635/0.0166	0.5525/0.0276	0/0	0.5635/0.0166	0.5525/0.276	1.12/0.044
Cutter Air						
HH-53	0.1475/0.0328	0.1475/0.0328	0/0	0.1475/0.0328	0.1475/0.0328	0.295/0.066
UH-1N	0.08197/0	0.08197/0	0/0	0.08197/0	0.08197/0	0.164/0
SEL-911	0.03279/0	0.03279/0	0/0	0.03279/0	0.03279/0	0.066/0
C-12	0.1803/0.0492	0.1803/0.0492	0/0	0.1803/0.0492	0.01803/0.0492	0.361/0.098
CNA-441	0.0164/0	0.0164/0	0/0	0.0164/0	0.0164/0	0.033/0
F-14	0.0164/0	0.0164/0	0/0	0.0164/0	0.0164/0	0.033/0
C-131	0.0164/0	0.0164/0	0/0	0.0164/0	0.0164/0	0.033/0

TABLE 3.2 (Cont'd)

Aircraft	Departures	Arrivals	Closed Patterns	Total Takeoffs	Total Landings	Total Operations
Cutter Air (Cont'd)						
T-38	0.0164/0	0.0164/0	0/0	0.0164/0	0.0164/0	0.033/0
T-34C	0.0164/0	0.0164/0	0/0	0.0164/0	0.0164/0	0.033/0
Total Transients						199.924/0.523
Helicopters						
UH-1	2.5/0.4167	2.5/0.4167	50.0/1.0417	52.5/1.4584	52.5/1.4584	105/2.92
H-3	1.25/0.125	1.25/0.125	25.0/1.0417	26.25/1.1667	26.25/1.1667	52.5/2.33
H-53	1.25/0.125	1.25/0.125	25.0/1.0417	26.25/1.1667	26.25/1.1667	52.5/2.33
Total						210/7.58
Civil Nonscheduled[b]						
Composite business jet	4.4/0.37	4.41/0.37	0/0	4.4/0.37	4.41/0.37	8.81/0.74
Single-engine composite	79.81/6.76	79.82/6.75	0/0	79.81/6.76	79.82/6.75	159/13.5
Twin-engine composite	26.58/2.24	26.58/2.24	0/0	26.58/2.24	26.58/2.24	53.2/4.48
Total						222/18.7
Civil Scheduled						
727-Q9	22.53/1.69	22.51/1.69	0/0	22.53/1.69	22.51/1.69	45.0/3.38
737-300	16.08/1.2	15.95/1.20	0/0	16.08/1.2	15.95/1.20	32.0/2.4
737-QN	41.68/3.14	41.28/3.11	0/0	41.68/3.14	41.28/3.11	82.9/6.25
MD-81	6.59/0.49	6.57/0.50	0/0	6.59/0.49	6.57/0.50	13.1/0.99
DC-909	1.68/0.13	1.88/0.14	0/0	1.68/0.13	1.88/0.14	3.56/0.27
L-1011	0.72/0.05	0.94/0.07	0/0	0.72/0.05	0.94/0.07	1.66/0.12
DHC-6	3.79/0.29	3.8/0.29	0/0	3.79/0.29	3.8/0.29	7.59/0.58
DHC-7	4.76/0.35	4.76/0.36	0/0	4.76/0.35	4.76/0.36	9.52/0.71
CNA-441	42.81/3.22	42.8/3.22	0/0	41.82/3.22	42.8/3.22	85.6/6.44
Total						281/21.1

TABLE 3.2 (Cont'd)

Aircraft	Departures	Arrivals	Closed Patterns	Total Takeoffs	Total Landings	Total Operations
Miscellaneous Operations						
Aero Club (COMPSEP[c])	5.281/0.258	5.281/0.258	0/0	5.281/0.258	5.281/0.258	10.5/0.516
Civil Air Patrol (COMPSEP[c])	2.0/0.0333	2.0/0.0333	0/0	2.0/0.0333	2.0/0.0333	4.0/0.067
U.S. Customs						
HH-53	0.871/0	0.871/0	0/0	0.871/0	0.871/0	1.74/0
CNA-441	1.355/0.129	1.355/0.129	0/0	1.355/0.129	1.355/0.129	2.71/0.258
C-12	0.323/0.065	0.323/0.065	0/0	0.323/0.065	0.323/0.065	0.646/0.13
CNA-500	0.742/0.097	0.742/0.097	0/0	0.742/0.097	0.742/0.097	1.48/0.194
Total Misc. Scheduled						21.276/1.165
Airport Total						1,005/53

[a]Numbers such as 1.5/1.5 indicate day/night operations.

[b]Includes air cargo operations.

[c]Single-engine propeller aircraft.

The departures and approaches listed in that log were summed and then divided by the number of days (181) that the Transient Alert Facility was in operation. That facility was in operation 7 days a week, but it was not open 24 hours a day. Before January 1, 1989, the Alert facility was open only from 8 a.m. to 5 p.m., and after January 1 it was open from 6 a.m. to 10 p.m.

Before October 1, 1988, transient aircraft were received by Cutter Air. Since then, Executive Air alone has accepted transients. The data in Table 3.2 listing Cutter Air represent operations data averaged over the period August 1 through October 1, 1988.

Overall, a daily average of 1,005 daytime and 53 nighttime civil and military flight operations occur at the field. Military aircraft contribute 502 operations during the day and 13 operations at night. Current runway utilization for each of the aircraft types is given in Table 3.3. About 70% of the military aircraft operations are on Runway 08, 5% are on Runway 35, 5% on Runway 17, and 20% on Runway 26.

A Federal Aviation Administration (FAA) Part 150 Study is currently being conducted for Albuquerque International Airport by Greiner Engineering Sciences Inc. Data on civil aircraft flights (operations and tracks) were obtained from that firm (Greiner Engineering Sciences 1986). The operations data contained in the computer file were current as of 1988, and as part of the present study, the 1988 data were modified to account for increases in number of operations as projected by Greiner Engineering Sciences.

Civil flight operations are traditionally counted using the "average day" concept, with each day of the week having equal weighting. For example, a flight that occurs only Monday through Friday is represented by 5/7 of an operation. Nighttime operations include any flight that arrives or departs between 10 p.m. and 7 a.m. In contrast, military operations were accounted for using the "typical busy day" concept, but with the same definition of nighttime hours as that used for civil aircraft flights.

TABLE 3.3 Runway Utilization at Albuquerque International Airport

Aircraft Category/ Operation	Utilization (%)							
	Runway 08	Runway 26	Runway 17	Runway 35	Runway 03	Runway 30	Runway 12	Runway 21
MAC scheduled[b] (C-130H)	70	20	5	5	0	0	0	0
ANG scheduled[b,c] (A-7D, C-130H)	70	20	5	5	0	0	0	0
Navy scheduled								
A-7D and F-18[b]	70	20	5	5	0	0	0	0
Piper Cheyenne								
Landings	63	27	3	7	0	0	0	0
Departures	60	15	5	5	5	5	5	0
Transients[b]	70	20	5	5	0	0	0	0
Civil nonscheduled								
Landings	25	7	8	3	24	32	1	1
Departures	59	10	14	0	0	2	8	8
Civil scheduled								
Landings	63	27	3	7	0	0	0	0
Departures	64	27	7	3	0	0	0	0
Aero Club (COMSEP[d])								
Landings	25	7	8	3	24	32	1	0
Departures	82	13	0	3	0	0	0	2
Civil Air Patrol (COMSEP[d])								
Landings	25	7	8	3	24	32	1	0
Departures	100	0	0	0	0	0	0	0
Cutter Air								
Misc. military[b]	70	20	5	5	0	0	0	0
CNA441								
Landings	63	27	3	7	0	0	0	0
Departures	70	20	5	5	0	0	0	0
U.S. Customs								
Misc. military[b]	70	20	5	5	0	0	0	0
CNA500								
Landings	25	7	8	3	24	32	1	0
Departures	63	27	5	5	0	0	0	0
CNA441								
Landings	63	27	3	7	0	0	0	0
Departures	63	27	5	5	0	0	0	0

[a]All helicopters were modeled to operate off of a short equivalent runway parallel to Runway 08/26, which is located in the area of the helicopter pads.

[b]Landings and departures.

[c]Existing and future.

[d]COMSEP = single engine prop.

Table 3.2 includes the fleet mix and daily operations for the civil aircraft at Albuquerque International Airport. The majority of operations by scheduled aircraft involve 727-Q9, 737-300, and 737-QN aircraft. The number of operations by small-engine and twin-engine planes is about the same as the number by these three largest scheduled airliners.

The existing helicopter flights depart from Albuquerque International Airport and then conduct training flights at the auxiliary field in the southwestern corner of Kirtland AFB. Numerous closed patterns are flown in the vicinity of the auxiliary field on a daily basis (see Table 3.2).

Noise Modeling Methodology

Noise contours representing existing (baseline) conditions in the vicinity of Kirtland AFB were prepared using (1) the NOISEMAP model and methodology for military aircraft, and (2) the Integrated Noise Model (INM) (version 3.9) for the civil aircraft. The resulting noise-exposure estimates are expressed in terms of the day-night average sound level (L_{dn}). The L_{dn} value is the 24-hour average sound level, in A-weighted decibels (dB), for the period from midnight to midnight, obtained after addition of 10 dB to sound levels occurring during the night (10 p.m. to 7 a.m.). NOISEMAP and INM model predictions were made on a 100 x 100 point grid (1,000-ft spacing) centered on Runway 17/35 at Albuquerque International Airport.

The NOISEMAP and INM methodologies take into account the effect of aircraft single events (source acoustic power, altitudes, and air speeds), the number of times such events occur during a 24-hour period, and the time of day that they occur. NOISEMAP uses the following flight data: aircraft type, flight profiles (including power settings and speed schedules), flight track locations, number of operations per track, runway utilization schedules, and ground run-up (testing) data. Standardized flight data for each civil aircraft type are not input but are contained within INM computer code. This standardization of flight profiles simplifies the user input for INM. Appendix A describes the L_{dn} methodology as it relates to NOISEMAP and INM.

Figure 3.3 shows the layout of the airfield and the general land use pattern in the surrounding community. As shown, land use in the area outside Kirtland AFB and Albuquerque International Airport boundaries is all residential and commercial. Figure 3.3 also shows the locations of eight sensitive receptors (residential areas, schools, hospitals, and similar locations) near the airport that were selected for noise impact analysis. These locations are shown as points A through H on the figure.

Figure 3.4 shows the noise contours generated from the NOISEMAP and INM models for the current level of aircraft activity (military plus civilian) at the field as of May 1989. Figure 3.5 presents the noise contours for the auxiliary field resulting from the military helicopter flights that occur there. Currently, training flights are made there with the UH-1, H-53, and H-3 helicopters. Figure 3.6 presents the ground tracks followed by those helicopters during a typical day.

Appendix B presents component noise contours included in Fig. 3.4. Figure B.1 presents the noise contours for the military transient aircraft alone. Figure B.2 presents the ground tracks for the flight patterns of those transient aircraft. Figure B.3 presents the A-7D noise contours from contributions of the ANG and Navy flights. Figure B.4 presents the flight tracks from those A-7D flights. Figure B.5 presents the noise contours for the civil aircraft at Albuquerque International Airport. Figure B.6 presents the MAC C-130 noise contours. Other than a change in the helicopter flights, it is the C-130 operations that would be changed in the future options discussed in Chapter 4. Figure B.7 presents the flight tracks for the MAC C-130 aircraft for the existing (May 1989) condition.

Analysis of the figures leads to the following conclusions:

- The major contributors to the noise at Albuquerque International Airport are the A-7D aircraft, the civil aircraft, and the transient military aircraft, with the A-7D aircraft dominating the contours.

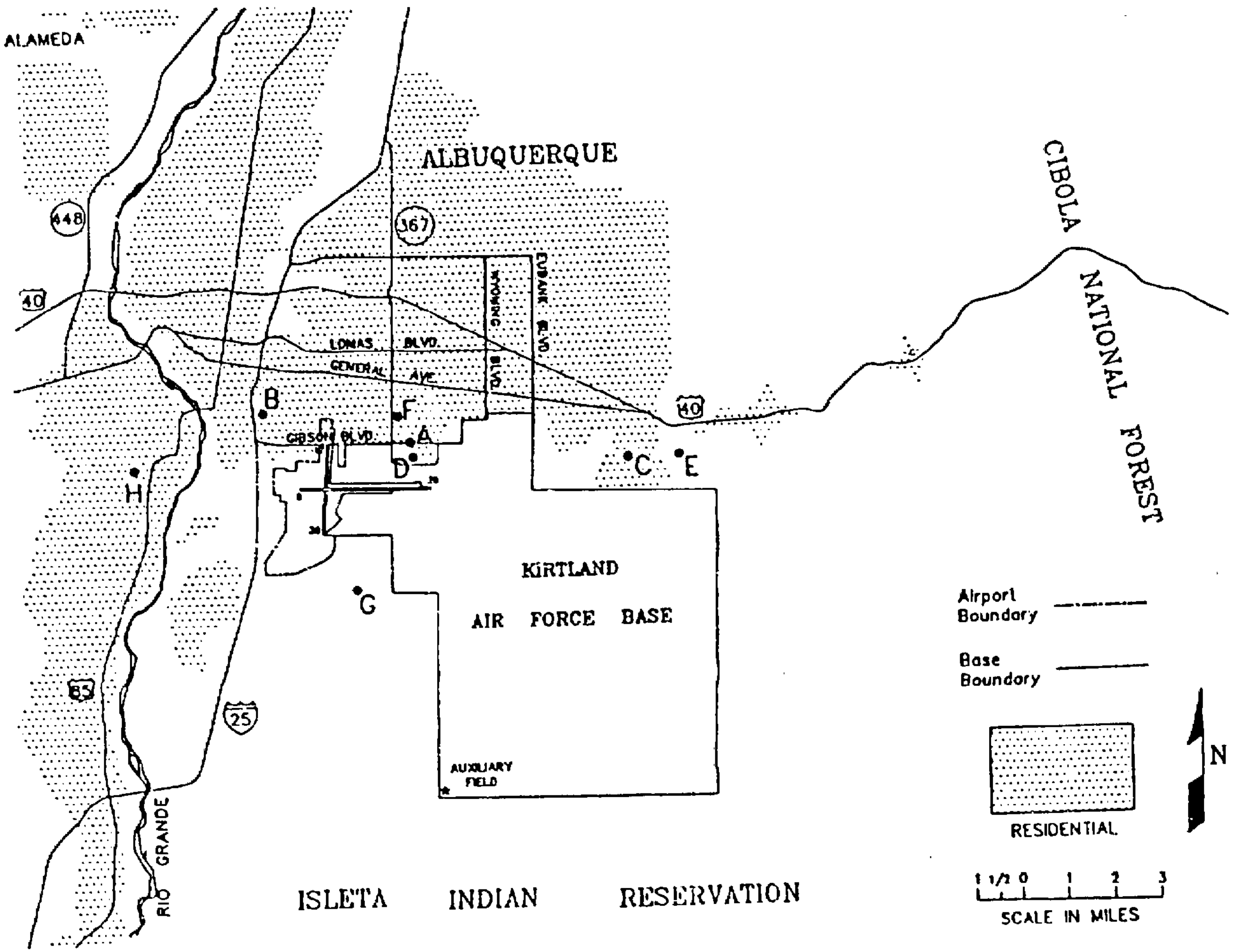

FIGURE 3.3 Land Uses in the Vicinity of Kirtland AFB and Locations of Eight Sensitive Receptors Selected for Noise Analysis (locations A-H are identified in Table 3.4)

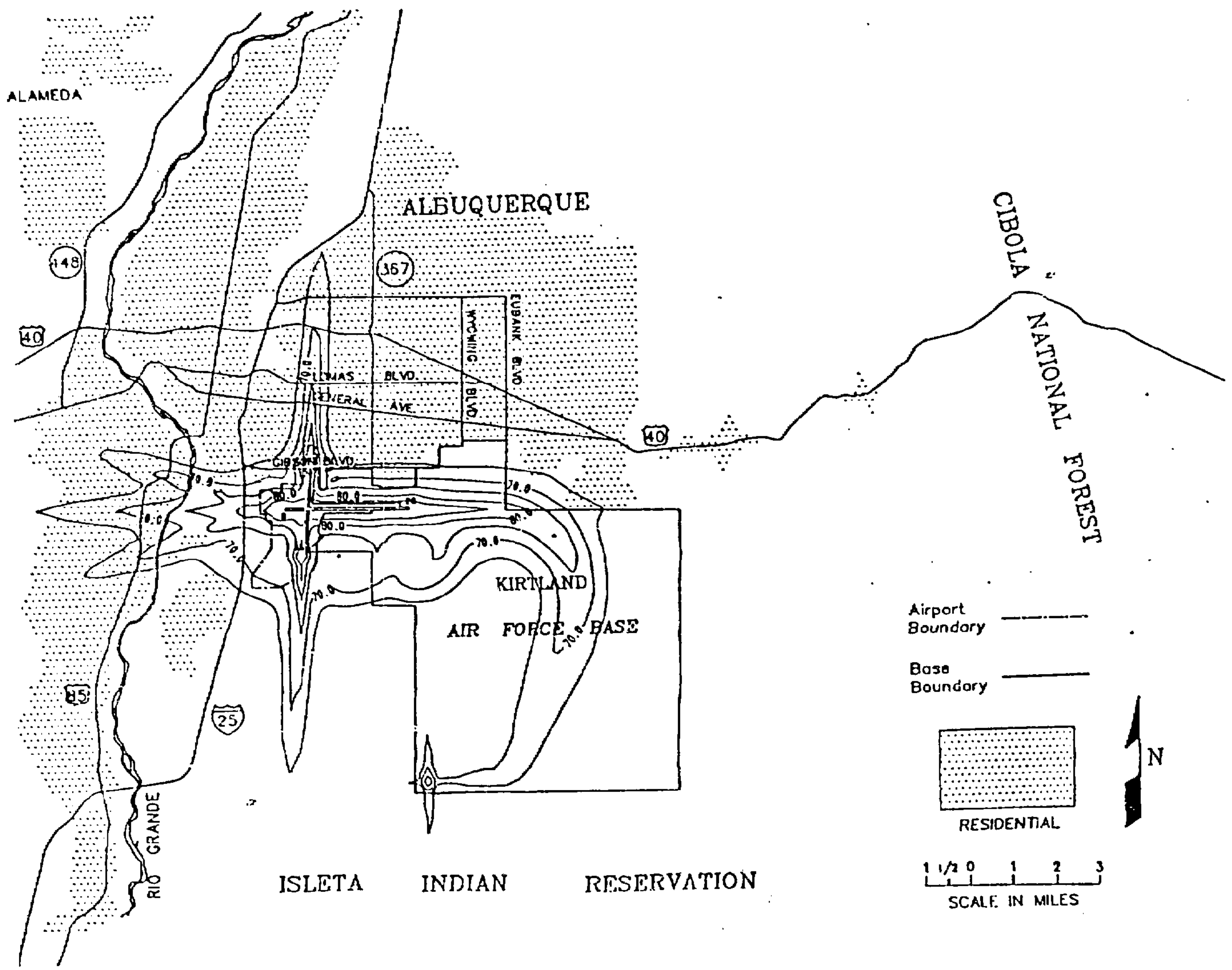

FIGURE 3.4 L_{dn} Contours for All Flight Operations under the Existing (1989 baseline) Situation with A-7D, C-130, F-18, and Transient Military Aircraft; Ground Run-Up Operations, and Civil Aircraft

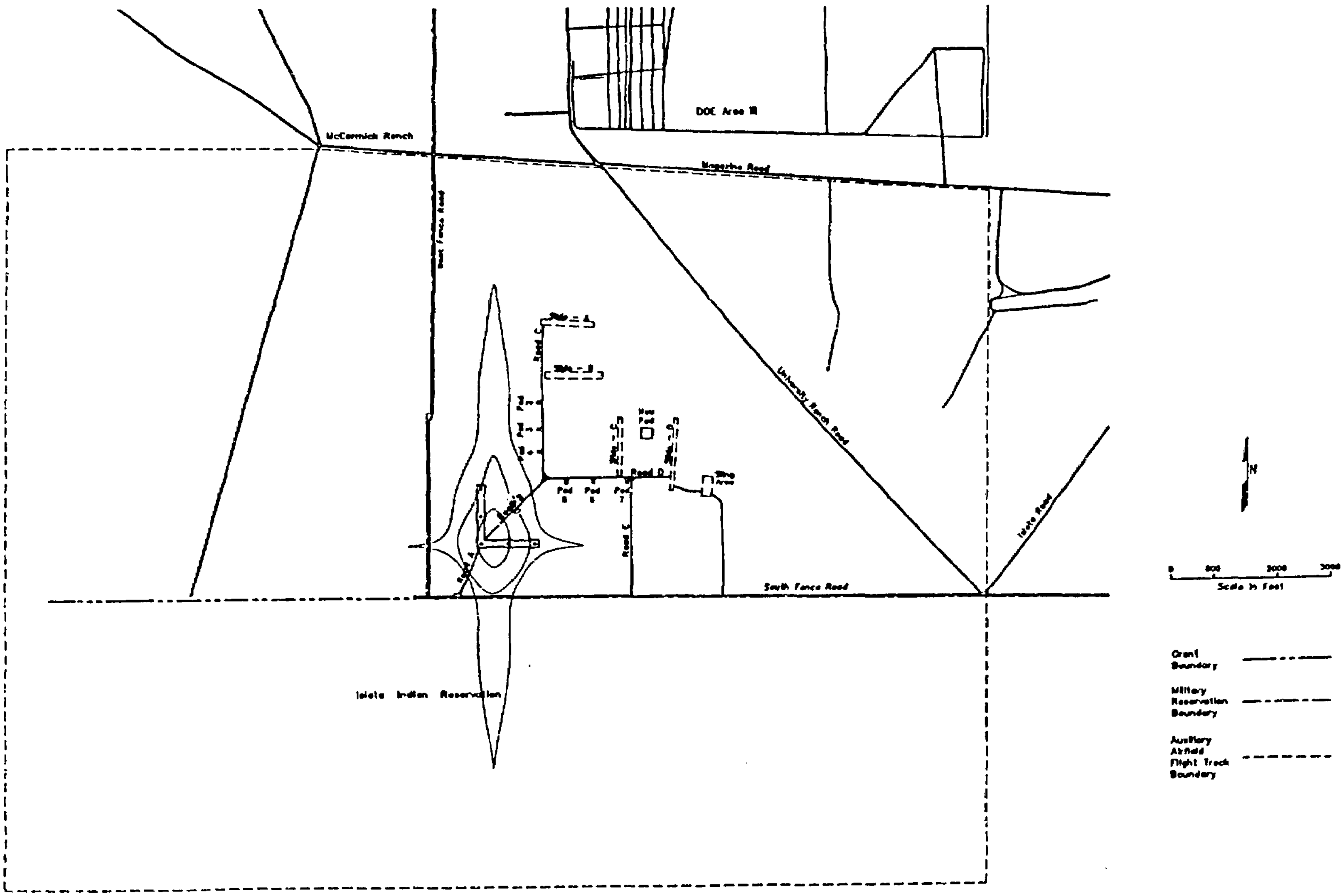

FIGURE 3.5 L_{dn} Contours for Military Helicopter (UH-1, H-3, and H-53) Operations at the Auxiliary Field — Existing Scenario (1989)

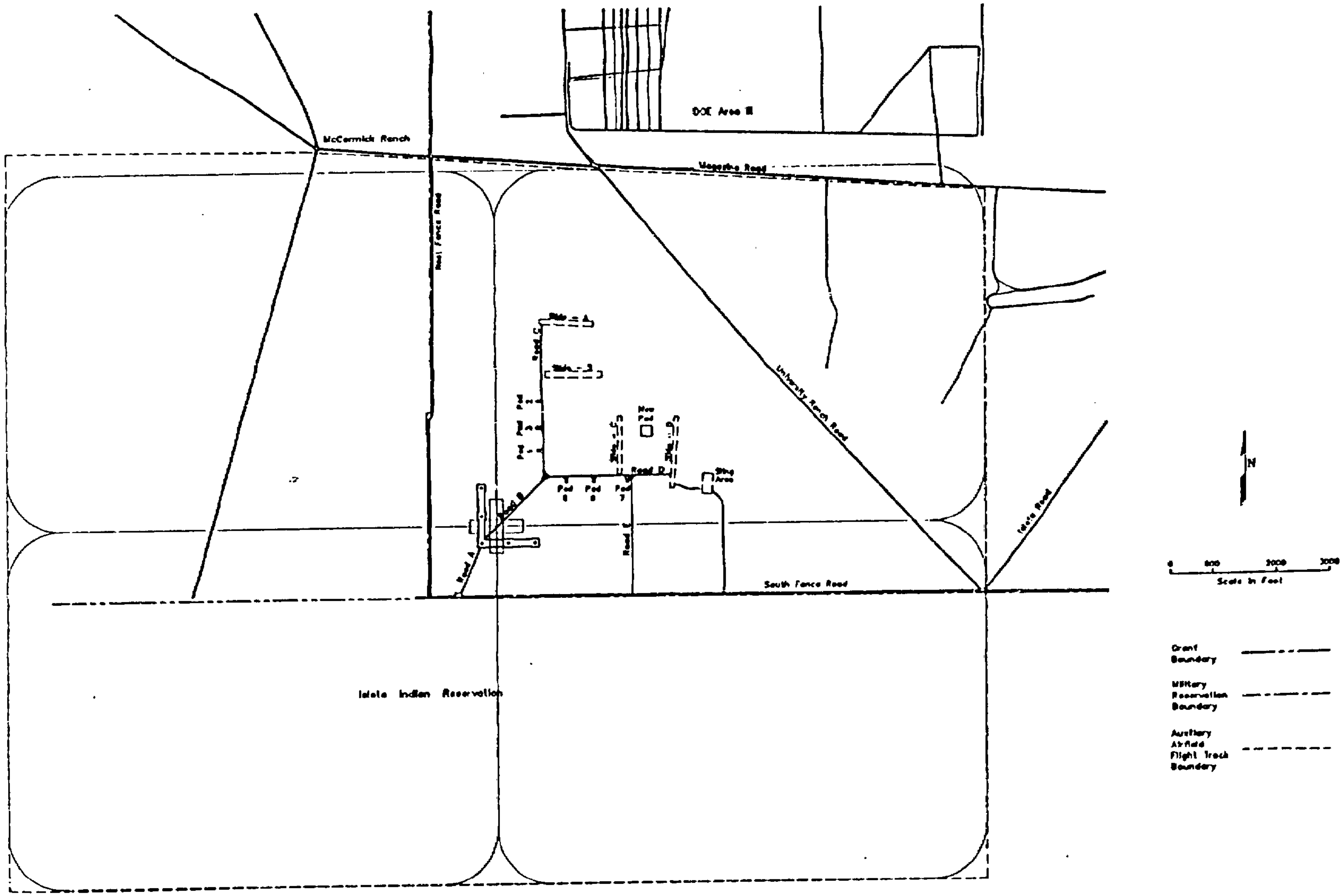

FIGURE 3.6 Ground Tracks Followed by Military Helicopters at the Auxiliary Field —Existing Condition (1989)

- The noise contours for the transient military aircraft are significantly affected by the closed patterns flown by the F-15, F-16, F-14, A-7D, A-4, T-37, and T-38 aircraft. Each of these flies an average of 11.4 closed patterns per day -- all to the west and south of the airfield. Consequently, the contours expand to the west and south of the airfield.
- The A-7D contours exhibit three "fingers" to the west caused by Runway 26 departures to the west on headings of 240, 260, and 280 degrees. The finger to the east curves to the south, reflecting the fact that the only A-7D daily departure in that direction (80 degrees east of north) goes out 1.5 nautical miles (nm) to the east (beyond the end of the runway) before the A-7D turns (with a 1.5-mi radius) to a heading of 190 degrees.
- The shape of civil aircraft noise contours accurately reflects the fact that all planes follow straight-in and straight-out paths and do not fly any closed or overhead patterns. Those contours extend in a simple manner along each of the four runway ends.
- The MAC C-130 noise contours are extremely small, reflecting the facts that (1) the C-130 is a comparatively quiet aircraft, and (2) there are few operations of that aircraft (2.5 during the day and 3.5 during the night).
- Ground run-up noise contours are so small that no values are predicted above 65 dB. Consequently, no plot is provided of those contours.
- The noise contours for the auxiliary field are above 65 dB only in the region in which the closed patterns cross each other. At points in that region, the noise created by each pattern is added to the

noise from other flights that pass over those points, and the resulting cumulative noise level exceeds 65 dB. The 65-dB contour extends outside the military reservation in two places: (1) to the south (into Isleta Indian Reservation), and (2) slightly to the west of West Fence Road.

Single-Event Analysis

Table 3.4 lists eight key noise-sensitive locations in the vicinity of Albuquerque International Airport selected for purposes of this noise impact assessment. The noisiest operations of the major aircraft (A-7D, C-130, and 727-200 fixed-wing aircraft and H-53 helicopters) were compared. The 727-200 is the noisiest of the civil aircraft that fly into Albuquerque International Airport on a routine basis. In this analysis, the single-event noise level (SEL) calculated for a particular receptor location during the noisiest flyover characterizes the worst-case short-term impact of an individual event. A departure, an approach, or a closed pattern can lead to the maximum noise level at each receptor location. For only the A-7D aircraft, formation (two-ship) takeoffs (i.e., two A-7D aircraft taking off at the same time) were used for the calculations. Because two-ship departures are noisier (by 3 dB) than single-ship flights, only two-ship flights were considered for departures of the A-7D in this single-event analysis. Approximately 10% of A-7D departures are done in two-ship formations. No two-ship approaches occur with the A-7D or the other aircraft. For closed patterns, only single aircraft are considered.

Single-event noise level predictions were made for the military aircraft using the NOISEMAP computer code. Given the east-west and north-south coordinates of any receptor, NOISEMAP identifies the 18 noisiest flying operations that contribute to the L_{dn} value at that receptor. In addition, the SELs are computed for each of those 18 noisiest operations.

TABLE 3.4 Comparison of Single-Event Noise Levels at Receptor Locations A-H

Receptor[a,b]	Military Aircraft				
	A-7D	C-130	H-53	Peak Military	727-200[c]
Location A					
Noise level (dB)	94.3	78.9	76.3	99.2[d]	88.6
Operation[e]	T	T	T	T	T
Runway	26	08	08	08	08
Location B					
Noise level (dB)	94.5	80	83.3	94.5[f]	87.2
Operation[e]	T	T	L	T	T
Runway	17	35	08	17	35
Location C					
Noise Level (dB)	96.3	80	72.9	101.5[g]	90.4
Operation[e]	T	L	L	T	T
Runway	08	26	26	08	08
Location D					
Noise level (dB)	94.7	81.4	79.2	102.3[d]	92.3
Operation[e]	T	T	L	T	T
Runway	08	08	26	26	08
Location E					
Noise level (dB)	94.8	79.2	67.2	100.1[g]	81
Operation[e]	T	L	L	T	T
Runway	08	26	26	08	08
Location F					
Noise level (dB)	90.9	71.8	70.6	95.7[h]	83.1
Operation[e]	T	T	T	CP	T
Runway	17	35	08	35	35
Location G					
Noise level (dB)	94.5	75.9	72	110[h]	90.9
Operation[e]	T	T	T	CP	T
Runway	35	17	26	35	17
Location H					
Noise level (dB)	107.4	80.9	83	107.4[f]	95.2
Operation[e]	T	L	L	T	T
Runway	26	08	08	26	26

[a]Receptor legend:
- A Lovelace Bataan Medical Center
- B University of New Mexico (South Campus), University Arena
- C Four Hills Park
- D Veterans Administration Hospital
- E Four Hills Country Club clubhouse
- F Whittier Park and Community Center
- G Albuquerque Police Rehabilitation Farm
- H St. Ann's School

[b]Locations are shown in Fig. 3.3.

[c]Civil aircraft.

[d]F-18 aircraft.

[e]T = takeoff; L = landing; CP = closed pattern.

[f]A-7D aircraft.

[g]F-4 (transient) aircraft.

[h]A-4 (transient) aircraft.

The results indicate that for all eight receptor locations, the C-130 and H-53 operations are the least noisy, and the A-7D and various military transient operations are the noisiest. Operations by the 727-200 aircraft are the second noisiest. The H-60 helicopter has slightly higher SEL values than the C-130.

Noise-Abatement Procedures

Documents currently addressing noise-abatement procedures at Albuquerque International Airport include (1) a Letter of Agreement among the Airport Traffic Control Tower, the military, and the airport, (2) an Air Traffic Control Tower Letter to Airmen, (3) Albuquerque Noise Ordinance, and (4) Albuquerque Zoning Regulations.

The Letter of Agreement establishes noise abatement procedures that are applied by the Albuquerque Airport Traffic Control Tower to aid in reducing aircraft noise over the city. The goal of those procedures is to limit turboprop and turbojet operations near and over the residential noise-sensitive areas of Kirtland AFB East, Northeast Heights, and Four Hills. The item in the letter relating to military aircraft states that all military jet aircraft departing Runway 8 shall turn right on departure. In addition, all turboprop and turbojet departures with left turns off Runway 8 should delay their left turn until about 13.5 nm from the Albuquerque VORTAC navigational aid.

The Aircraft Traffic Control Tower Letter to Airmen (No. 83-1) identifies the noise sensitive areas (Kirtland AFB East, Northeast Heights, and Four Hills) and encourages turboprop and jet aircraft operating near or over these areas to reach the maximum altitude possible with a flight path that minimizes noise consistent with safety and traffic. The requested departure path establishes a northward corridor between Eubank and Juan Tabo Boulevards east of the airport. Aircraft approaching Runway 26 are encouraged to remain as high as feasible or slightly south of the Runway 26 centerline until past the Four Hills area. Finally, straight-out departures through Tijeras Canyon are discouraged.

The City of Albuquerque has adopted an ordinance (21-1975) controlling various forms of noise. The ordinance prohibits aircraft run-ups for testing, maintenance, or repair that exceed 50 dB, or 10 dB above the ambient noise level (whichever is higher), measured within any inhabited residential zone during the nighttime hours (10 p.m. to 7 a.m.).

In its airport zoning regulations (No. 65-1979), the city limits permissible uses in areas where the the L_{dn} is (1) greater than 75 dB, and (2) between 65 and 75 dB. Additional letters of agreement exist with the city of Albuquerque but these letters relate to the civil aircraft rather than military operations.

Noise Complaints

Most of the noise complaints at the Albuquerque International Airport are due to flights of the A-7D or other jet aircraft (commercial aircraft or F-18). The typical scenario for noise complaints involves the use of the alternate runway for both military and commercial aircraft because of wind conditions. In such a circumstance, residents are not used to having aircraft near their homes and sometimes react by phoning in a complaint. Over the past year (June 1988 - June 1989), however, there have been no noise complaints due to flights of the C-130 aircraft. During the past year, there were two noise complaints resulting from flights of the military helicopters. However, both complaints were due to helicopter training activities some distance from the airport in the towns of Tijeras and Carrizozo. The complaints related to low-flying training missions.

3.2.3 Wastes and Stored Fuel

About one-fourth to one-third of the sanitary sewage generated in Kirtland East (east of Louisiana Blvd.) is treated in a two-cell sewage lagoon. Most of the rest of the sanitary sewage generated on the base is transported by sewer lines to the city of

Albuquerque sewage treatment facility. (However, there are a few scattered septic tanks in remote areas of the base.) In addition, a primary treatment plant exists for the Manzano Area. Nonhazardous solid wastes are transported by a service contractor to designated disposal sites. All solid wastes are disposed of in accordance with Air Force and Kirtland AFB regulations (Kirtland AFB 1983).

A number of potentially hazardous materials are used at the base. These materials are handled in accordance with federal, state, and local standards. Hazardous wastes generat[illegible]irtland AFB are associated with the following facilities or activities: industrial shops, research and development laboratories, pesticide and herbicide application, radiological testing, fire control training, fuel management, Sandia Laboratory, and Lovelace Laboratory. Wastes produced by these operations are listed in the Installation Restoration (IRP) Phase I document for the base (Engineering-Science, 1981). Much of the more hazardous wastes are placed in drums or pumped to the Defense Property Disposal Office (DPDO), which manages the process for off-site disposal of the wastes (e.g., to licensed burial sites). Guidance for collection, storage, and disposal of most hazardous wastes is provided by the Hazardous Waste Management Plan (Camp Dresser and McKee undated). Guidance for special hazardous wastes, such as asbestos, hydrazine, and radioactive materials, is provided by other regulations or plans. Toxic chemical wastes are collected semiannually by base personnel and are delivered to one of two hazardous waste storage facilities for disposal by the DPDO (Kirtland AFB 1983). All hazardous wastes are shipped to approved off-site facilities (Camp Dresser and McKee, Inc., undated). Less hazardous wastes are discharged to storm or sanitary sewers after appropriate treatment. No base wastes are directly discharged into receiving waters (Kirtland AFB 1983).

Procedures for handling any spills of hazardous wastes are established in formal planning documents (e.g., Oil and Hazardous Substances Pollution Contingency Plan and Spill Prevention Control and Countermeasure Plan (see Camp Dresser and McKee, Inc., undated) that are periodically reviewed and updated as needed.

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Public Law 96-510), as amended, the Department of Defense (DOD) has initiated an IRP to identify, report, and correct any environmental contamination present at DOD facilities from past activities that could result in groundwater contamination and probable migration of contaminants beyond facility boundaries. No known water pollution problems are associated with any of the IRP sites at Kirtland (Kirtland AFB 1983). No widespread environmental degradation has been identified from IRP investigations; thus only long-term monitoring of IRP sites is currently planned (Science Applications 1985).

3.2.4 Water Resources

Kirtland AFB is drained primarily by the Rio Grande, located about 4 mi west of the base boundary. Runoff from the base either drains into the river via overland flow to arroyos (Tijeras Arroyo and Arroyo del Coyote occur on base), canals, and man-made drainages, or infiltrates surface soils. The only permanent surface waters in the portions of the base that would be affected by the proposed realignments and basing changes are three ponds at the golf course and two sanitary sewage stabilization lagoons. Man-made drainages occur mostly in the northern, developed portion of the base. Natural drainages include the two arroyos mentioned above and an unnamed drainage between them (Science Applications 1985).

Localized flooding on the base occurs only for brief periods when surface drainage flow is restricted within the arroyos (Engineering-Science 1981). No facilities or operations involved in the proposed realignment would occur within the boundaries of the 100-year floodplain.

The Santa Fe Formation is the primary regional aquifer and is the source for most water (including drinking water) used on the base. Under Kirtland AFB the water table occurs at depths of 300 to 400 ft west of the Hubbell Springs fault and at shallow depths (about 54 ft) east of the fault (Engineering-Science 1981; Science Applications 1985). Twelve active base wells serve as the supply for most of the water, although backup supply can be obtained from the city of Albuquerque. The active wells are all west of the fault at depths relatively protected from any surface contamination (Engineering-Science 1981). Base operations are not believed responsible for contamination that has been detected in wells outside the Kirtland AFB boundaries (Engineering-Science 1981).

3.2.5 Vegetation and Wildlife Resources

Two general ecological associations occur at Kirtland AFB: the pinyon-juniper association (at elevations above 5,800 ft) and the grassland association. Facilities and activities associated with the realignment and basing changes would occur in the grassland association. More than 50 species of grasses occur within this association. The principal species are black gramma (*Bouteloua eriopoda*), galleta grass (*Hilaria jamesii*), sand drop-seed (*Sporobolus cryptandrus*), sand muhly (*Muhlenbergia arenicola*), and three-awn grasses (*Aristida* spp.). Sand sage (*Artemisa filifolia*) and four-wing saltbush (*Atriplex canescens*) are also common. Several species of cacti are also more prevalent inside the Kirtland AFB boundaries than outside the base. This is because the areas inside the base are more protected from collectors and vandals (Martin and Wagner 1974).

The arroyos that transect the base support a somewhat different assemblage of plant species. Dominant species there include the four-wing saltbush, Apache plume (*Fallugia paradoxa*), and rabbitbush (*Chrysothamus nauseosus*); with introduced and native pioneer species being common (Martin and Wagner 1974). Numerous trees and shrubs have been planted on the developed portions of the base; while grass plantings have been conducted on both improved and semi-improved portions of the base. Grounds maintenance occurs annually in these areas (Kirtland AFB 1979).

The environment in the areas that would be utilized for construction and/or operations of the proposed realignment and basing changes has been affected by past and ongoing construction, maintenance, and operational activities. Thus, most of the vegetated areas are mowed or actively landscaped, or are in early stages of succession. Additionally, plant species and growth are somewhat constrained due to both the presence of a hard pan and the low level of nutrients in the soil (Martin and Wagner 1974)

Birds are the most often seen wildlife on the base; with common species being the horned lark, meadow lark, thrashers, sparrows, scaled quail, starling, robin, and crow. A number of rodent species are also common to abundant. Larger mammals such as coyote, fox, skunk, and rabbit also frequent the site. The golf course ponds and sanitary sewage lagoons provide habitat and a water source for a number of birds and mammals. A thorough listing of observed and expected species on Kirtland AFB can be found in Martin and Wagner (1974).

3.2.6 Threatened and Endangered Species

Three federally listed endangered species occur in the area of Kirtland AFB: peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), and whooping crane (*Grus americana*) (U.S. Fish and Wildlife Service 1984). No confirmed sittings of the peregrine falcon have been reported on Kirtland AFB (Dow, undated). The bald eagle generally prefers forested areas such as those that occur east of the base, thus may only occur over the base on rare occasions. The whooping crane only rarely goes over the base (for example, if blown by a storm off its migratory route over the Rio Grande River). The potential for any of these species to occur near areas involved in the proposed realignments and basing changes is highly unlikely because of the general rarity of the species in the Albuquerque area, absence of preferred habitat near base facilities, and the previously mentioned disturbances that have already occurred in the areas that would be affected by the proposed actions.

3.2.7 Socioeconomics

Bernalillo County is the most populous county in New Mexico, comprising just over 32% of the state's total population. The 1985 population of the county was estimated at 464,300 people, a 10.5% increase from the 1980 population of 420,262 (U.S. Bureau of the Census 1986). This growth trend is consistent with the rapid population increase that has been occurring throughout most of the state since 1980. The city of Albuquerque had a population of 331,767 in 1980, a 35.7% increase from 1970 (U.S. Bureau of the Census 1983). Based on population estimates for 1985/1986, population densities in Bernalillo County and the city of Albuquerque are 359 and 3,481 people/mi^2, respectively.

Although the total number of active duty and guard/reserve personnel at the base was 6,045 in 1988, the number of military and civilian employees associated with Kirtland AFB totals 20,740 (Kirtland AFB 1988). In 1988 more than $329 million was appropriated to military and civilian activities at the base, and the total payroll was more than $945 million.

3.2.8 Cultural Resources

The area occupied by Kirtland AFB has an extensive history, most of which is related to military activity (Albert and Putnam 1982). However, aviation activities at the site began as a commercial endeavor as early as 1928. Later, the air base was very instrumental as a training facility during World War II, as well as a research and development center for atomic weapons both during and after World War II. Although to date no structures on the base have met eligibility criteria for inclusion in the *National Register of Historic Places* (NRHP), several structures may be eligible. None of these potentially eligible structures is in an area that would be used for the proposed action.

Several cultural resource surveys have been conducted on Air Force-owned land managed by the National Forest Service (Lintz et al. 1988). Two of the 13 areas surveyed will require more intensive archaeological surveys for future projects, but again none is in an area that would be involved in the realignments or other basing changes evaluated in this EA.

3.2.9 Land Use

Kirtland AFB occupies 52,450 acres near Albuquerque. The Isleta Puebo Indian Reservation is located along the southern boundary of the base, and Cibola National Forest is to the east. Within the national forest, 18,302 acres nave been withdrawn for USAF use, and 4,595 acres have been withdrawn for DOE use. Albuquerque International Airport is northwest of the base. The remaining area to the west of Kirtland AFB, all the way to Interstate 25, is vacant land. Residential areas are to the north, and business and residential areas lie to the west of Interstate 25.

Northern portions of the base contain family housing. A golf course and riding stables lie to the south of the concentration of base facilities. Aircraft mobilization and maintenance facilities are located around the runways (which are shared with the Albuquerque International Airport).

4 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

4.1 DIRECT AND INDIRECT EFFECTS AND THEIR SIGNIFICANCE

4.1.1 Air Quality

Air pollution emissions expected in FY 1991 after the increase in C-130 operations and the changes in helicopters were compared to existing (FY 1989) emissions to evaluate the potential impacts of the proposed action on air quality. Military Airlift Command personnel estimated that in FY 1991 there would be 4.6 landing-takeoffs and no closed patterns flown daily by the C-130 aircraft. Starting in FY 1990 and continuing thereafter, helicopter operations would invoive the same flight schedule for the UH-l, no flights of the H-3, an increase of 3.625 landing-takeoffs for the H-53, and new operations of the H-60 totaling 4 landing-takeoffs and 51.042 closed patterns.

Data on annual emissions for all military aircraft were obtained from a report by Seitchek (1987). The approach used in that report was to review measurements made by other groups and then recommend modal emission factors, engine modes for each aircraft, time in mode, and fuel use for each mode and each engine.

Table 4.1 shows that there would be a net increase in all five criteria pollutants in FY 1991. Additional air quality analyses were conducted to estimate the impact of these increases on air quality at the base boundary. The analyses were conducted using the methods recommended by Seitchek (1987). This analysis was carried out by examining the worst hour of the day for air emissions. That worst hour would have:

- All MAC C-130 operations for the entire day occurring within that hour at Albuquerque International Airport, all helicopter operations for the day occurring within that hour from the helipad located nearest to Albuquerque International Airport, and

TABLE 4.1 Aircraft Emissions for Existing (1989) Operations and for Future Operations after Increases in C-130 Aircraft and Helicopters

Options/Aircraft	Emissions (metric tons per year)				
	CO	HC	NO_x	PM	SO_x
Existing (FY 1989)					
Assigned Military					
A-7D	237.93	174.48	40.447	1.586	4.124
F-18	5.227	0.687	1.69	0.041	0.259
C-130 (ANG)	4.653	2.97	0.98	0.149	0.188
C-130 (MAC)	37.224	23.76	7.841	1.188	1.505
Transients	232.537	85.58	66.403	7.763	11.06
Helicopters	98.855	60.968	27.524	2.606	4.177
Total Pollutants	616.426	348.445	144.885	13.333	21.313
Future (FY 1991)					
Assigned Military					
A-7D	237.93	174.48	40.447	1.586	4.124
F-18	5.227	0.687	1.69	0.041	0.259
C-130 (ANG)	4.653	2.97	0.98	0.149	0.188
C-130 (MAC)	57.077	36.432	12.023	1.822	2.307
Transients	232.537	85.58	66.403	7.763	11.06
Helicopters	149.51	86.378	38.827	4.091	5.827
Total Pollutants	686.934	386.527	160.37	15.452	23.765

- At the auxiliary airfield, a maximum of six helicopters flying closed patterns at the same time during that hour. A total of 22 closed patterns would be flown per helicopter for a total of 132 closed patterns flown at the auxiliary field during a worst-hour at that field.

Tables 4.2 and 4.3 show the pollutant concentration increments calculated for the site boundaries (Albuquerque International Airport and the auxiliary field, respectively) for this level of flight operations and under conservative meteorological conditions (F atmospheric stability class, 1 m/s wind speed). The boundary location at Albuquerque International Airport is on the western side at the intersection of the boundary with the extension of Runway 17/35. The boundary point used for the auxiliary field is in the middle of the southern border of the auxiliary field. The 3-hour and 24-hour pollutant concentrations were estimated using correlations in the report by Seitchek (1985). Although they are not calculated, annual average concentrations would be less than the maximum 24-hour prediction because "worst-hour" conditions would prevail only for a small fraction of the time during the year. Tables 4.2 and 4.3 show that the incremental increases in pollutant concentrations resulting from the basing changes would be small and only a fraction of the air quality standards. Pollutant levels would still be well within air quality standards after addition of existing air pollutant concentrations and the increments caused by the proposed changes.

The increases in HC and NO_x would have some effect on the production of ozone in the area. However, these projected increases are very small compared to regional releases, so the incremental effect would be very small.

Various construction activities associated with the basing changes would cause short-term emissions of small amounts of fugitive dust at Kirtland AFB. However, with implementation of appropriate control measures (e.g., periodic watering or application of chemical dust suppressants), the concentration of TSP at the field boundary would be minimally elevated.

TABLE 4.2 Predicted Increases in Air Ambient Pollutant Levels At Albuquerque International Airport Boundary due to the Increased C-130 and Helicopter Operations, FY 1991 and Beyond

Pollutant	New Mexico Standard	Ambient Level	Worst-Case Contribution	Worst-Case Total
Total suspended particulates ($\mu g/m^3$)				
24-hour	150	112.0[a]	0.36	112.36
Annual	60	50.7[a]	-	-
Sulfur dioxide ($\mu g/m^3$)				
24-hour	260	N/A[b]	0.51	-
Annual	52	N/A	-	-
Carbon monoxide (ppm)				
8-hour	8.7	7.1[c]	0.01	7.11
1-hour	13.1	13.0[c]	0.013	13.013
Nitrogen oxides ($\mu g/m^3$)				
24-hour	200	N/A	3.09	-
Annual	100	N/A	-	-

[a]Monitoring station at 600 Anderson St. N.E.

[b]N/A = Not available.

[c]Monitoring station at 2421 Mesilla St. N.E.

TABLE 4.3 Predicted Increases in Ambient Pollutant Levels at Auxiliary Field Boundary due to Increased Helicopter Operations, FY 1991 and Beyond

Pollutant	New Mexico Standard	Ambient Level	Worst-Case Contribution	Worst-Case Total
Total suspended particulates ($\mu g/m^3$)				
24-hour	150	112.0[a]	2.15	114.15
Annual	60	50.7[a]	-	-
Sulfur dioxide ($\mu g/m^3$)				
24-hour	260	N/A[b]	4.33	-
Annual	52	N/A	-	-
Carbon monoxide (ppm)				
8-hour	8.7	7.1[c]	0.042	7.142
1-hour	13.1	13.0[c]	0.06	13.06
Nitrogen oxides ($\mu g/m^3$)				
24-hour	200	N/A	22.9	-
Annual	100	N/A	-	-

[a]Monitoring station at 600 Anderson St. N.E.

[b]N/A = Not available.

[c]Monitoring station at 2421 Mesilla St. N.E.

4.1.2 Noise

Frequency of Flight Operations

The projected operations by MAC C-130 aircraft and by military helicopters after all proposed basing changes are shown in Table 4.4. The numbers of operations by all other types of aircraft are assumed to remain the same as shown in Table 3.2 for existing (FY 1989) conditions. The average daily C-130 operations would increase from 6 in FY 1989 to 9.2 in FY 1991. However, a significant portion of these flights would occur during nighttime hours. Considering that the L_{dn} noise concept counts 1 nighttime flight as 10 daytime flights, the increase in terms of equivalent daytime flights would be from 37.5 operations in FY 1989 to 55.1 operations in FY 1991.

Military helicopter operations also would change as a result of the proposed basing changes. Comparison of Table 4.4 (FY 1991) with Table 3.2 (FY 1989) shows that UH-1 helicopter activity would not change, but the H-3 helicopters would be eliminated, the H-53 helicopter operations would increase, and new H-60 helicopters would be added to the fleet. The changes in helicopter operations are assumed to occur in FY 1990 and continue in future years. As is now the case, the closed patterns by the helicopters would be flown at the auxiliary field, and the departures and arrivals would all be at the helicopter pads at Albuquerque International Airport.

Day-Night Average Sound Level

The NOISEMAP methodology was used to compute L_{dn} contours for FY 1991 after all basing changes. Figure 4.1 presents the MAC C-130 noise contours in FY 1991, and Fig. 4.2 presents the composite noise contours for all aircraft activity at Albuquerque International Airport in that year. The latter plot includes the following types of aircraft: A-7D (ANG and Navy), C-130 (MAC and ANG), F-18, military

TABLE 4.4 Average Daily MAC C-130 and Helicopter Operations at Kirtland AFB in 1991 after Proposed Basing Changes[a]

Aircraft	Departures	Arrivals	Closed Patterns	Total Takeoffs	Total Landings	Total Operations
MAC C-130	2.3/2.3[b]	1.8/2.8	0/0	2.3/2.3	1.8/2.8	4.1/5.1
Helicopters						
UH-1	2.5/0.4167	2.5/0.4167	50.0/1.0417	52.5/1.4584	52.5/1.4584	105/2.92
H-53	2.5/2.5	2.5/2.5	25.0/1.0417	27.5/3.5417	27.5/3.5417	55/7.08
H-60	2.0/2.0	2.0/2.0	50.0/1.0417	52/3.0417	52/3.0417	104/6.08
Total						264/16.1

[a]The number of average daily operations of all other types of aircraft not listed in this table are assumed to remain the same as shown in Table 3.2 for the existing conditions.

[b]Numbers such as 2.3/2.3 indicate day/night operations.

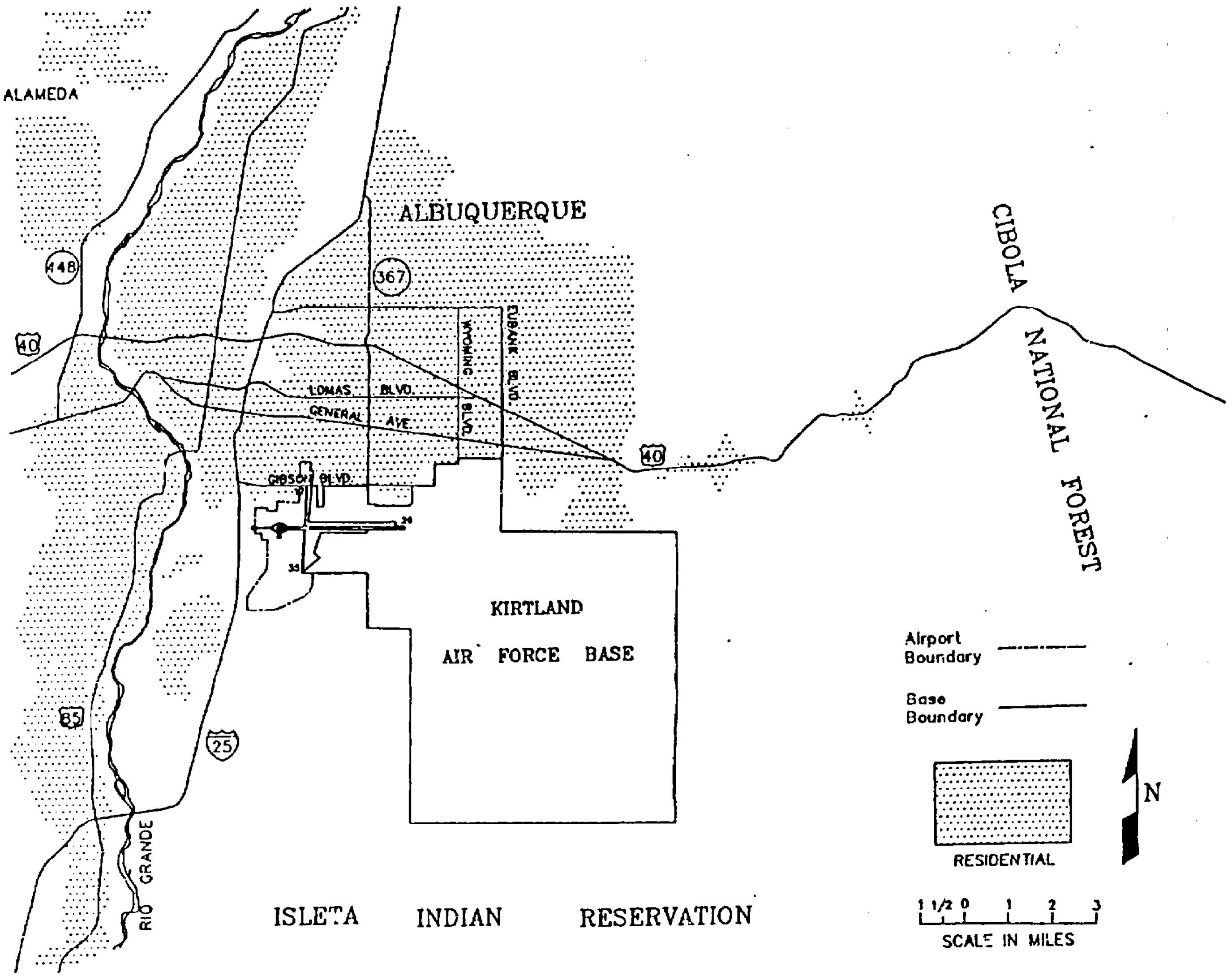

FIGURE 4.1 L_{dn} Contours for MAC C-130 Operations in FY 1991

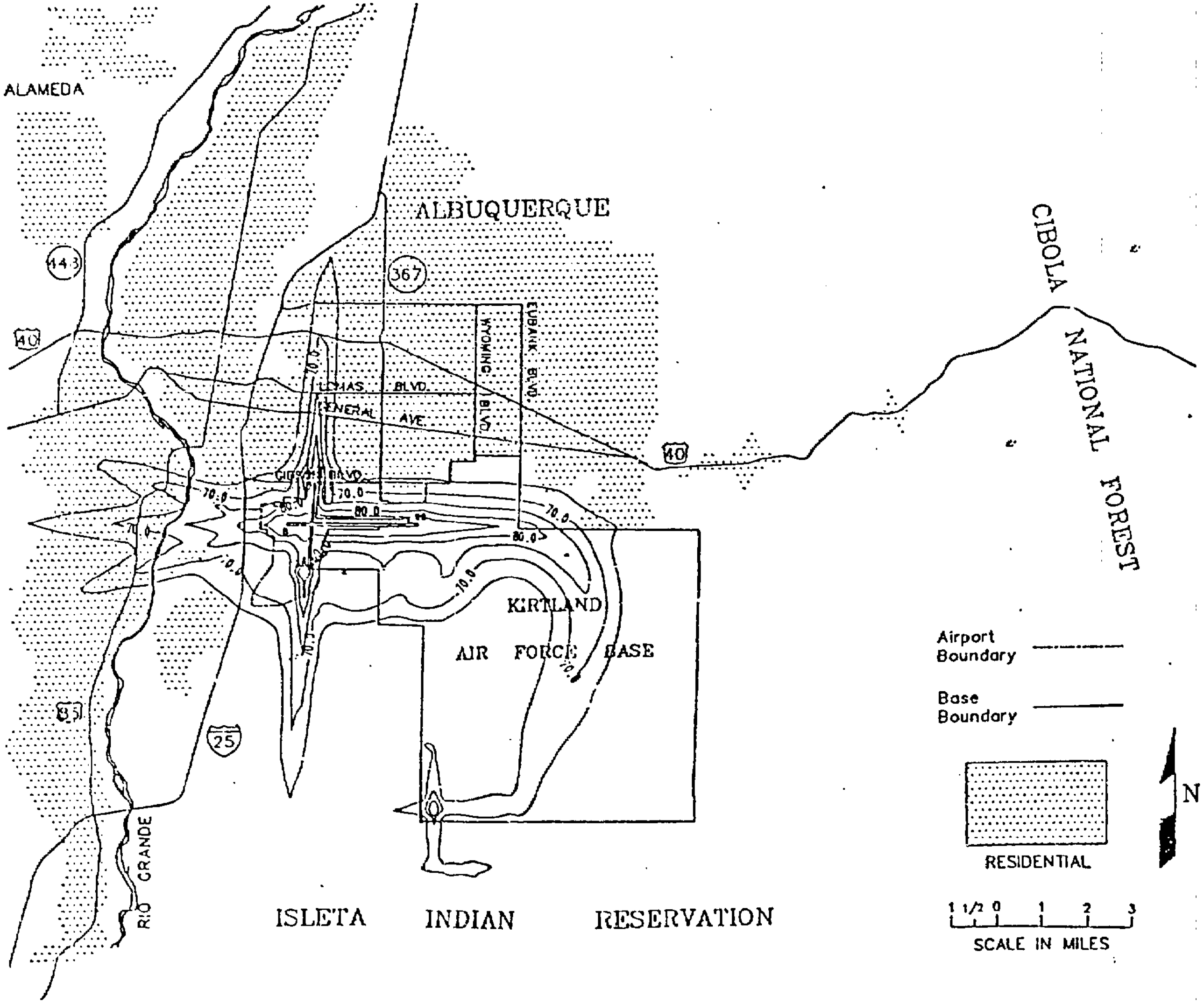

FIGURE 4.2 L_{dn} Contours for All Flight Operations in FY 1991 (includes A-7D, C-130, F-18, and transient military aircraft; ground run-up; civil aircraft; and miscellaneous Aircraft)

transients, civil aircraft, and the miscellaneous category (which includes the Aero Club, the Civil Air Patrol, and t[illegible] Customs). Figure 4.2 corresponds to Fig. 3.4 for the existing conditions. The o[illegible] differences are the changes in operations by the MAC C-130 aircraft and the military helicopters.

Comparison of Figs. 4.1 and 4.2 with Fig. 3.4 shows that the changes in the C-130 operations would have a very small impact on the combined noise contours for all activity in FY 1991 and that the the MAC C-130 aircraft by themselves produce extremely small noise contours.

Figure 4.3 presents the FY 1991 L_{dn} contours at the auxiliary field caused by changes in military helicopter operations. Figure 4.4 shows the ground tracks followed by the military aircraft during the training flights at the auxiliary field. Comparison with Figs. 3.5 and 3.6 reveals only a moderate expansion in the size of the contours. The lobes in the contours to the east, west, north, and south are enlarged, but the overall shape of the contours is similar. Apparently the removal of the H-3 helicopters does not cancel out the increase in operations of the H-53 helicopters and the addition of the new H-60 helicopters. An interesting feature of Figs. 4.2 and 3.4 is the joining of the Albuquerque International Airport 65-dB contour with the auxiliary field 65-dB contour. They are not separate sets of contours as might have been expected.

In summary, it can be concluded that the changes proposed for the C-130 aircraft operations would not affect the noise contours in FY 1991. In addition, the changes in helicopter operations would make only a moderate change in the noise contours at the auxiliary field.

Single-Event Analysis

Single-event noise levels that would be produced after the changes in operations of the C-130 would be the same as the current levels because flight patterns, power

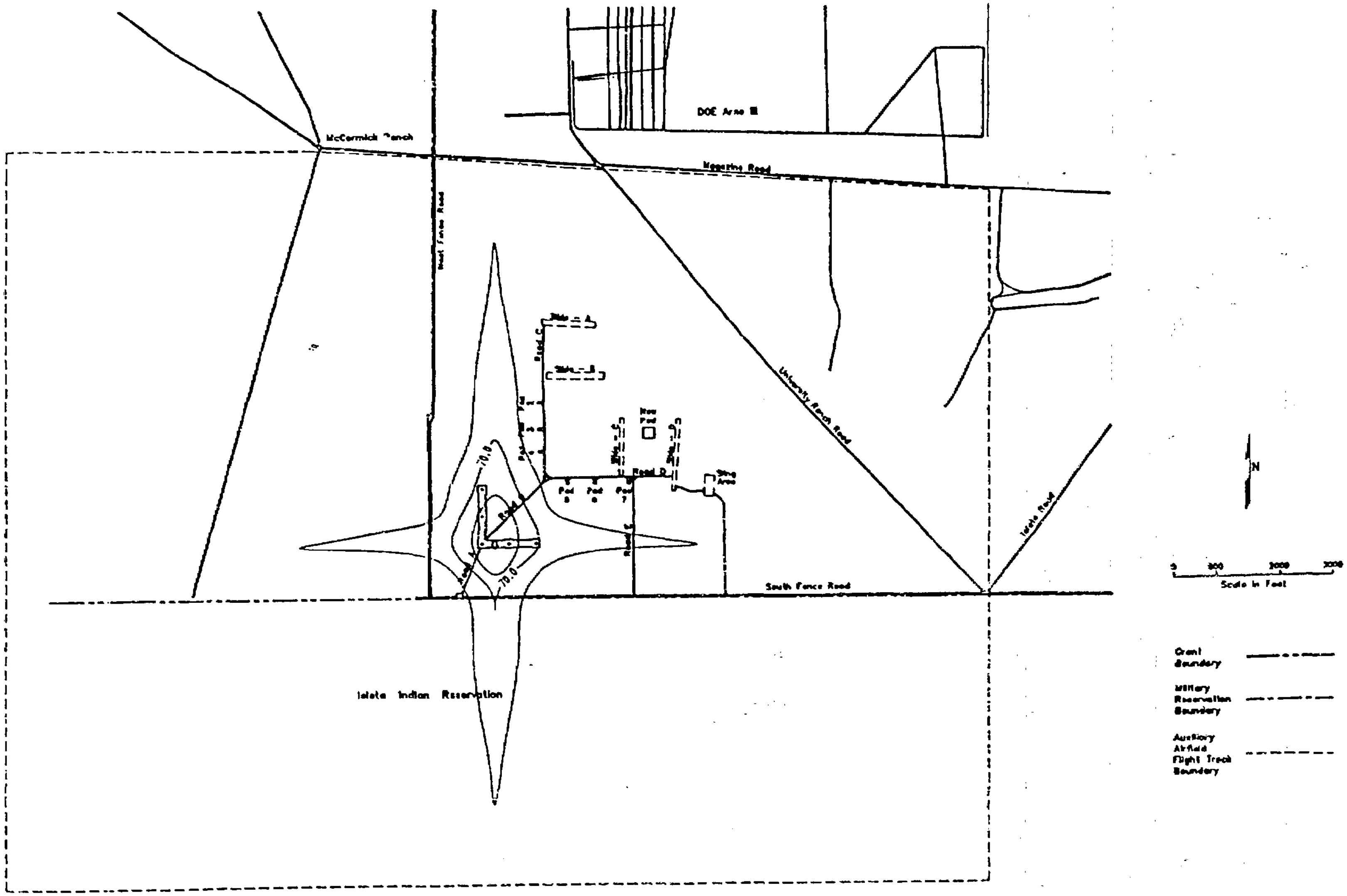

FIGURE 4.3 L_{dn} Contours for Military Helicopter (UH-1, H-53, and H-60) Operations at the Auxiliary Field — FY 1990 and Beyond

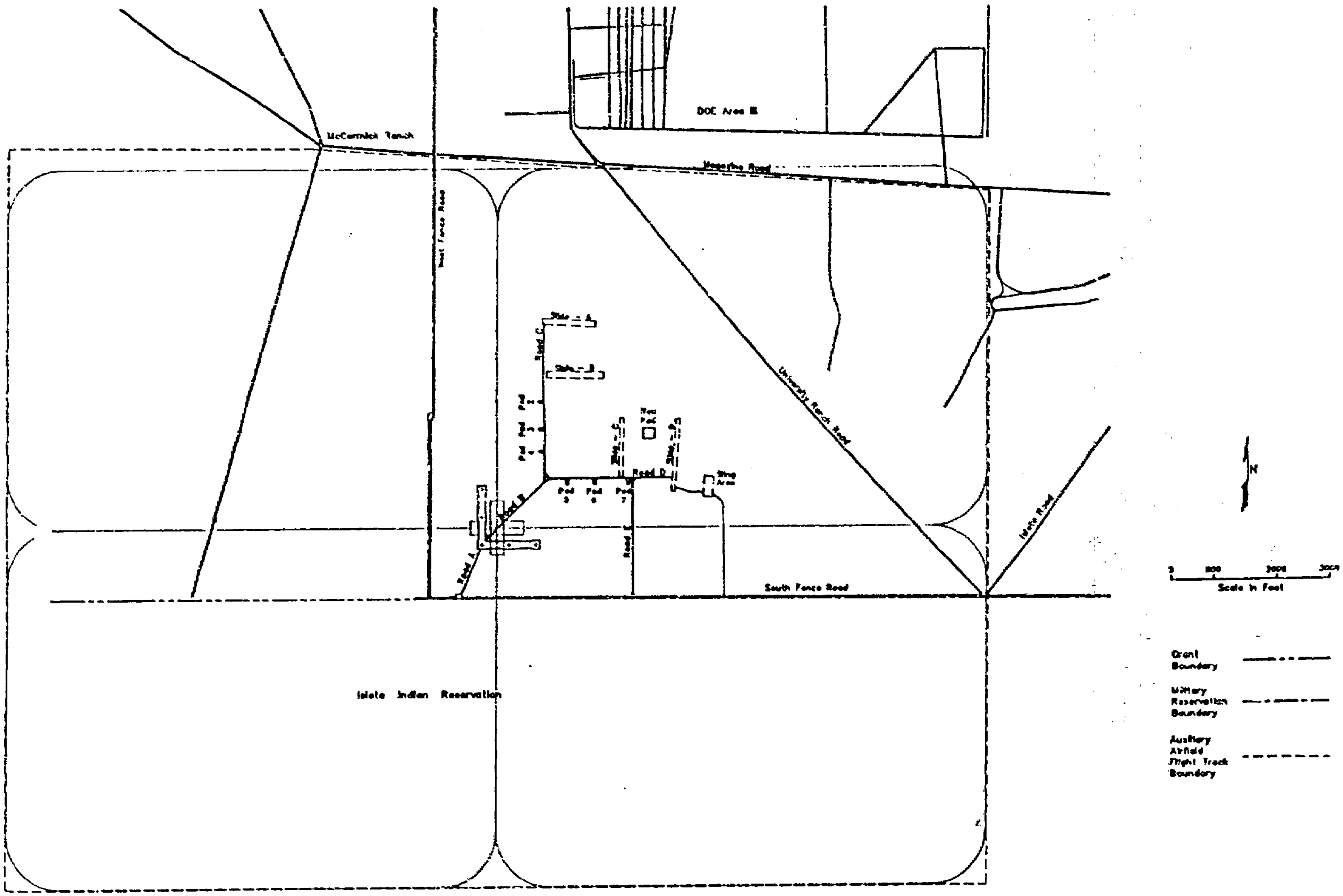

FIGURE 4.4 Ground Tracks Followed by Military Helicopters at the Auxiliary Field — FY 1990 and Beyond

settings, air speeds, and altitudes would not change with those aircraft. Only the number of operations per day would change. The discussion in Sec. 3.2.2 on C-130 single-event noise levels applies here as well.

Relative to the military helicopters, the new H-60 would be added to the fleet. However, in the noise modeling carried out for the helicopters, the H-60 was modeled as an H-53 in the NOISEMAP data base. The NOISEMAP data base contains only eight helicopters, and the H-60 is not one of them. The decision to represent the H-60 by the H-53 was made in consultation with Dr. Paul Schomer of the Construction Engineering Research Laboratory in Urbana, Illinois, a noted helicopter noise expert. Consequently, the single-event table (Table 3.4) in Sec. 3.2.2 includes a column for the H-53 helicopter. A discussion of H-60 single-event noise levels therefore follows the discussion of the H-53 helicopters as presented in Sec. 3.2.2. Data in Table 3.4 show that single-event noise levels for helicopters are small at the sensitive receptor locations studied and are much smaller than the levels created by the A-7D and the 727-200 aircraft.

4.1.3 Wastes and Stored Fuels

Some minor, temporary increases in sanitary wastes would be expected during construction. In addition, minor, long-term increases in sanitary wastes would be expected because of the increase in personnel and their families (i.e., an increase of about 4% over current staffing levels). Nevertheless, the city sewage treatment facilities have more than adequate capacity to handle these increases, as well as increases associated with planned growth of Albuquerque (Kirtland AFB 1983).

Construction of the proposed facilities would generate a measurable volume of nonhazardous wastes, such as scrap lumber, metal, and masonry. The collection and disposal of such wastes would be specified in the construction contract. Following construction of facilities, the volume of nonhazardous waste generated would be similar to that currently produced.

The hazardous wastes generated at Kirtland AFB are managed in accordance with applicable federal and state regulations. The types and volumes of hazardous wastes expected following the basing changes would be similar to those associated with current operations at the base.

Proposed locations for facilities and activities associated with the realignment and basing changes do not coincide with any of the identified IRP sites. Thus, the proposed action would not be affected by any existing contaminated waste sites.

Appropriate revisions, modifications, and/or additions to various plans pertaining to hazardous material and waste storage, handling, disposal, and emergency spill responses would be made to accommodate any operational changes caused by the basing changes. This would especially apply to the use and cleanup of the crash-site laboratory.

4.1.4 Water Resources

Any increases in water requirements caused by increases in personnel would be well within the capacities of existing systems. Operations associated with the realignment and other basing changes would not adversely affect surface or groundwater resources.

Proposed construction sites are not located near any major drainages on the base. Thus, no impacts on surface water resources are expected from erosion and siltation or from contamination by spilled motor oil, hydraulic fluid, or other petroleum products during construction.

All construction and other activities associated with the realignment and other basing changes would occur outside of the 100-year floodplain.

4.1.5 Vegetation and Wildlife Resources

Construction of a new facility to house the AFISC (unless an existing facility is modified for that purpose) and occasional disturbance to the proposed 30-acre crash-site laboratory would be the only major activities physically affecting areas that provide habitat of any consequence to ecological resources. The areas affected would represent only a small proportion of the thousands of acres of unimproved and semi-improved land on the base that provides equal or, mostly, higher quality habitat. Vegetation would be mostly cleared within construction areas. Limited additional vegetated areas adjacent to construction sites might also be temporarily disturbed by construction activities and equipment or by use as construction laydown areas. Impacts that would occur to wildlife in these limited areas would include: (1) loss or alteration of habitat with subsequent loss or alteration of carrying capacity for wildlife populations, and (2) disturbance of wildlife by noise and human activities.

The two sites, especially that for the AFISC building, would be in locations close to highly developed areas of the base that already are significantly altered from their natural state. Thus, these sites only provide marginal-quality wildlife habitat. Biota occurring at these sites are not unique to the area. To some extent, the vegetation that serves as food and cover would be lost, but adjacent areas would adequately supplement the loss. Mammals and birds currently inhabiting the proposed building site would be eliminated (either destroyed or displaced) from the area; while those inhabiting the test crash site would be subject to intermittent disturbances during periods when the site is used.

Following construction of the AFISC facility, land around the building would be landscaped and maintained in a manner similar to other lawn-like areas in the vicinity of other facilities. Wildlife that utilize such areas are primarily restricted to birds and small mammals typically encountered in landscaped urban and suburban habitats.

The habitats that would be impacted are not critical or highly unique for any wildlife species in the area. Based on this, and considering the small amount of habitat that would actually be affected, it can be concluded that continued survival of local wildlife populations would not be threatened by physical disturbance of habitats associated with the proposed realignment and other basing changes.

Wildlife may also be displaced or disturbed (especially during the construction phase and by aircraft associated with the basing changes) by the increased level of human activity and noise. This would apply to animals within auditory or visual range of these activities. However, considering that the animals in the area are already subject to such annoyances (e.g., from aircraft, helicopters, ground vehicles, and other base activities); they should already be somewhat acclimated to disturbances and should not be significantly impacted by activities associated with the realignment and other basing changes. Nevertheless, low-altitude overflights involve increased duration of noise and greater probability of visual perception of aircraft (Manci et al. 1988).

Increased flying hours associated with the basing changes could be expected to proportionally add to the annoyance currently experienced by wildlife in the vicinity of the base. Sound levels above 90 dB are generally adverse to mammals and cause a number of behavioral responses, such as retreating from the sound source, freezing, or a strong startle response. Much less adverse behavior results when sound levels are below 90 dB (Manci et al. 1988). Wildlife farther than about half a mile from the ends of the runways would not be exposed to single-event noise levels above 90 dB. Any adverse reactions would be expected to subside shortly after cessation of higher intensity noise levels (Manci et al., 1988); especially since wildlife already experience similar noise exposures.

Although bird strikes are not a significant problem at Kirtland AFB, the increased number of flights associated with the proposed basing changes could be expected to increase the potential for such events. Most bird strikes occur during aircraft takeoffs and landings, with wide-bodied planes being involved in significantly more strikes than narrow-bodied planes (Burger 1983). Bird strikes with helicopters would be less likely than with fixed-wing aircraft because of the slower speeds and maneuverability of helicopters. However, because most strikes involve small birds and occur only rarely, this issue should not be of significant concern.

4.1.6 Threatened and Endangered Species

The early successional habitat occurring in the areas designated for the AFISC building and crash-site laboratory are not critical habitat for any listed species. This plus the fact that the locations involved would be near areas regularly used by people make these sites undesirable for the few listed species that do occur in the area of Kirtland AFB. Thus, the proposed realignment would not impact threatened or endangered species in the vicinity of Kirtland AFB.

4.1.7 Socioeconomics

The proposed actions would result in an increase of 846 full-time personnel at the base (705 military and 141 civilian employees). Given the large size of the military and civilian employment at Kirtland AFB and the large population of Bernalillo County, these increases would result in minimal impact to the local economy. The construction activities associated with the basing changes would provide some short-term economic benefits to the area in the form of employment and the local purchase of building supplies.

4.1.8 Cultural Resources

The New Mexico State Historic Preservation Officer will determine if Kirtland AFB will be given cultural resource clearance for the proposed construction/modification activities. Because of the significant degree of ground disturbance and the lack of structures eligible for the NRHP in the proposed action area, it appears likely that no adverse effects to significant archaeological sites or historic structures would occur.

4.1.9 Land Use

If a new facility is constructed for the AFISC, it would be located in an open area near the Eubank Gate. All other construction associated with the proposed action would be in areas already used to support the various missions at Kirtland AFB. This part of the base contains facilities involved in aircraft mobilization and maintenance activities. The crash-site testing laboratory would be located between the golf course and the riding stables. Family housing would not be affected by any of the proposed construction activities.

The Federal Interagency Urban Noise Committee (FIUNC) has delineated several basic types of land use areas that are defined numerically by average noise levels (L_{dn}) and accident potential zones, and for which it is suggested that either restrictions or caution be exercised with regard to their use. The delineation of compatible land use zones is designed to assist local planning boards in minimizing noise impacts to the population.

The most restrictive land use category for residential areas is defined by average L_{dn} noise levels above 75 dB. Land in such an area requires the strictest zoning controls and the possibility of additional navigation easements. The second most restrictive land use zone for residential areas is defined as areas with L_{dn} noise levels between 65 and 75 dB. The FIUNC recommends that careful zoning control measures be implemented for land use in these areas to minimize noise impacts in newly developed residential areas. The controls recommended by FIUNC include the use of specialized acoustic building materials when constructing new residences. The third restriction zone is defined as land areas that do not currently fall within incompatible land uses but are close enough to require the exercise of caution in land use planning to ensure that development in these areas does not encroach on incompatible land use zones in the future.

Since L_{dn} noise levels in the vicinity of the runways would remain essentially the same after the basing changes, the number of people and occupied housing units exposed to noise levels above 65 dB would remain unchanged. No residences are located in the vicinity of the auxiliary field.

4.2 MITIGATIVE MEASURES

No necessary mitigative measures have yet been identified other than those that would routinely be implemented at construction sites to control erosion, runoff, and generation of fugitive dust.

5 REFERENCES

Alberts, D.E., and A.E. Putman, 1982, *A History of Kirtland Air Force Base, 1928 - 1982*, Kirtland Air Force Base, N.M., June.

Burger, J., 1983, *Jet Aircraft Noise and Bird Strikes: Why More Birds Are Being Hit*, Environmental Pollution (Series A) 30:143-152.

Camp Dresser & McKee, Inc., undated, *Hazardous Waste Management Plan HWM OPLAN 195-83, Kirtland AFB, New Mexico*, prepared for 1606th Air Base Wing, U.S. Air Force, Kirtland AFB, Albuquerque.

Conley, M., 1989, Albuquerque Air Pollution Control Agency, Albuquerque, personal communication, June.

Dow, B.E., Undated, *Fish and Wildlife Management Plan, Kirtland Air Force Base, New Mexico*, Kirtland Air Force Base, Albuquerque.

Engineering-Science, 1981, *Installation Restoration Program Phase I: Records Search, Hazardous Materials Disposal Sites, Kirtland AFB, New Mexico*, prepared for U.S. Air Force AFESC/DEV, Tyndall AFB, Fla., Nov.

Greiner Engineering Sciences, Inc., 1986, *Albuquerque International Airport — FAR Part 150, Noise Exposure Maps and Noise Compatibility Program Recommendations*, sponsored by the City of Albuquerque, Jan.

Kirtland AFB, 1979, *Tab A-1 Environmental Narrative, Kirtland AFB Albuquerque, New Mexico*, Kirtland AFB, Albuquerque, Jan.

Kirtland AFB, 1983, *Tab A-1 Environmental Narrative, Kirtland AFB Albuquerque, New Mexico*, Kirtland AFB, Albuquerque, Jan.

Kirtland AFB, 1988, *Economic Resource Impact Statement, Fiscal Year 1988*, Kirtland AFB, Albuquerque.

Lintz, C., et al., 1988, *An Assessment of Cultural Resource Studies Conducted at Kirtland Air Force Base, Bernalillo County, New Mexico*, prepared by Mariah Associates, Inc., Albuquerque, for Military Airlift Command, Kirtland Air Force Base, Albuquerque, June.

Manci, K.M., et al., 1988, *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*, U.S. Fish and Wildlife Service, National Ecology Research Center Report NERC-88/29, Ft. Collins, Colo.

Martin, W.C., and W.L. Wagner, 1974, *Biological Survey of Kirtland Air Force Base (East)*, Sandia National Laboratories Report SAND74-0393, Albuquerque, Dec.

New Mexico Health and Environment Department, 1985, *Air Quality Bureau Annual Report 1983 and 1984*, Environmental Improvement Division, Air Quality Bureau Report EID/AIR-86/1, Albuquerque.

Science Applications International Corp., 1985, *Installation Restoration Program Phase II - Confirmation/Quantification Stage 1; Final Report for Kirtland AFB, New Mexico*, SAIC Report 2-827-06-351-33, prepared for Headquarters Military Airlift Command, Command Surgeon's Office, Bioenvironmental Engineering Division, Scott AFB, Ill., and U.S. Air Force, Occupational and Environmental Health Laboratory, Technical Services Division, Brooks AFB, Texas, March.

Seitchek, G.D., 1985, *Aircraft Engine Emissions Estimator*, Air Force Engineering and Services Center Report ESL-TR-85-14, Headquarters AFESC/RDVS, Tyndall Air Force Base, Fla., Nov.

U.S. Bureau of the Census, 1983, *County and City Data Book*, U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census, 1986, *Provisional Estimates of the Population of Counties: July 1, 1985*, Current Population Reports, Local Population Estimates, Series P-26, No. 85-52-C, U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census, 1987, *West, 1986 Population and 1985 Per Capita Income: Estimates for Counties and Incorporated Places*, Current Population Reports, Local Population Estimates, Series P-26, No. 86-WSC, U.S. Government Printing Office, Washington, D.C.

U.S. Fish and Wildlife Service, 1984, *Endangered and Threatened Species on U.S. Air Force Installations*, U.S. Fish and Wildlife Service Report FWS/OBS-84/10, Washington, D.C.

Walker, S., 1989, Albuquerque Air Pollution Control Agency, Albuquerque, personal communication, June.

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APPENDIX A:

L_{dn} METHODOLOGY

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A.1 NOISE ENVIRONMENT DESCRIPTOR (L_{dn})

The day-night average sound level (L_{dn}) metric for describing the noise environment was used to produce the noise contours presented in this assessment (Acoustical Society of America 1980). Efforts to provide a national uniform standard for noise assessment have resulted in adoption of L_{dn} by the U.S. Environmental Protection Agency (EPA) as the standard measure of noise for this procedure. It is used by numerous federal agencies, including the Department of Defense, Department of Housing and Urban Development, and the Federal Aviation Administration.

Use of the L_{dn} descriptor is a method of assessing the amount of exposure to aircraft noise and predicting the percentage of residents in a well-populated community that are *highly annoyed* (% HA) by the various levels of exposure (Committee on Hearing, Bioacoustics, and Mechanics 1977; Schultz 1978). The L_{dn} values used for planning purposes and for which contours are presented in this assessment are 65, 70, 75, 80, and 85 dB. Land use guidelines are based on the compatibility of various land uses with these exposure levels (U.S. Department of Defense 1964).

It is generally recognized that a noise environment descriptor should consider, in addition to the annoyance of a single event, the effect of repetition of such events and the time of day in which these events occur. Computation begins with a single-event energy descriptor and adds corrections for the number of events and the time of day. Since the primary noise impact relates to residential areas, nighttime events are considered more annoying than daytime events and are weighted 10 dB accordingly. The L_{dn} values are computed by first logarithmically summing the single-event energy values for all of the flight operations in a typical 24-hour day (after adding the 10 dB penalty to all nighttime-operation levels); then the average sound level is calculated for a 24-hour period.

As part of an extensive data-collection process, detailed information is gathered on the flight tracks flown by each type of aircraft assigned to the base and the number and time of day of flights on each of these tracks during a typical day. This information is used in conjunction with the single-event noise descriptor to produce L_{dn} values. These values are combined on an energy-summation basis to provide single L_{dn} values for the mix of aircraft operations at the base. Equal value points are connected to form the contour lines.

A.2 SINGLE-EVENT NOISE EVENT DESCRIPTOR (SEL)

The single-event noise energy descriptor used in the L_{dn} system is the sound exposure level (SEL). The SEL measure is an integration of the A-weighted sound pressure level over the time interval of a single event (such as an aircraft flyover), corrected to equivalent level for a reference period of 1 second. Frequency, magnitude, and duration vary according to aircraft type, engine type, and power setting. Therefore, individual aircraft noise data are collected for various types of aircraft/engines at different power settings and phases of flight. SEL versus slant range values are derived from noise measurements made according to a source noise data acquisition plan developed by Bolt, Beranek and Newman, Inc., in conjunction with the Armstrong Aerospace Medical Research Laboratory (AAMRL) and carried out by AAMRL (Bishop and Galloway 1975). These standard-day, sea-level values form the basis for the individual-event noise descriptors at any location and are adjusted to the location by applying appropriate corrections for temperature, humidity, altitude, and variations from standard aircraft operating profiles and power settings.

Ground-to-ground sound propagation characteristics are used for ground run-up activities. Air-to-ground propagation characteristics are used whenever the aircraft is airborne and the line-of-sight from observer to aircraft is 7 degrees or greater above horizontal; if the line-of-sight is 4 degrees or less, ground-to-ground propagation characteristics are used. Between these angles, propagation characteristics are interpolated (Speakman et al. 1977).

In addition to use for assessing aircraft flight operations, the L_{dn} metric can also be used to assess aircraft and engine run-up noise emissions resulting from engine/aircraft maintenance checks on the ground. Sounds such as aircraft/engine ground run-up noise are essentially constant in level during each test run at a given power setting. Data on the orientation of the noise source, type of aircraft or engine, number of test runs on a typical day, the power settings used and their duration, and use of suppression devices are collected for each ground run-up test position. This information is processed along with *mean sound pressure level* (average-energy level) data to yield equivalent 1-second sound exposure levels, which are added (on an energy-summation basis) to the SEL levels generated by flight operations to produce L_{dn} contours reflecting the overall noise environment produced by both air and ground operations of aircraft.

A.3 NOISE CONTOUR PRODUCTION

Data describing flight tracks, flight profiles, power settings, flight paths and profile utilization, and ground run-up information by type of aircraft/engine are assembled and processed for input into a central computer. L_{dn} contours are generated by the computer using the airfield-supplied operational data and the standard source-noise data corrected to local conditions. The computer system plots these contours, which are provided in the text.

A.4 COMPUTER PROGRAMS *NOISEMAP* AND *INM*

The L_{dn} methodology is implemented by use of the computer program NOISEMAP for military flight operations and by the Integrated Noise Model (INM) program for civilian flight operations. These codes are basically similar but differ in the format of their input-data requirements, as discussed in the *Day-Night Average Sound Level* subsection of Sec. 3.2.2. NOISEMAP was initially developed in 1974 by the Air Force (Horonjeff et al. 1974) and utilizes a subsidiary code *(OMEGA)* to provide a file of military flight and ground maintenance operational data by aircraft type. The INM code, first released by the Federal Aviation Administration (FAA) in 1978 (FAA 1977, 1978), also utilizes a subsidiary code *(DATABASE)* to provide a file of civilian aircraft operational data. The current versions of these codes (used for this study) are OMEGA 10, OMEGA 11, INM Version 3 (Flythe 1982; FAA 1987a), and INM DATABASE No. 9 (FAA 1987b).

A.5 REFERENCES

Acoustical Society of America, 1980, *American National Standard Sound Level Description for Determination of Compatible Land Use*, ANSI S3.23-1980 (R1986), New York.

Bishop, D.E., and W.J. Galloway, 1975, *Community Noise Exposure Resulting from Aircraft Operations: Acquisition and Analysis of Aircraft Noise and Performance Data*, U.S. Air Force Aerospace Medical Research Laboratory Report AMRL-TR-73-107, Wright-Patterson Air Force Base, Dayton, Ohio (Aug.).

Committee on Hearing, Bioacoustics, and Mechanics, Working Group 69, 1977, *Guidelines for Preparing Environmental Impact Statements on Noise*, National Research Council, National Academy of Sciences, Washington, D.C.

Federal Aviation Administration, 1977, *Airport-Land Use Compatibility Planning*, Advisory Circular 150/505-6, Washington, D.C., Dec. 30.

Federal Aviation Administration, 1978, *FAA World*, Vol. *8*, No. 5, Office of Public Affairs, Washington, D.C., May.

Federal Aviation Administration, 1987a, *INM, Integrated Noise Model, PC Version, User's Guide Supplement*, Washington, D.C.

Federal Aviation Administration, 1987b, *Integrated Noise Model (INM) DATABASE No. 9*, Washington, D.C., May 5.

Flythe, M.C., 1982, *INM, Integrated Noise Model, Version 3, User's Guide*, Federal Aviation Administration Report FAA-EE-81-17, prepared by CACI, Inc., Arlington, Va., Oct. (with Jan. and Aug. 1983 changes).

Horonjeff, R.D., R.R. Kandukuri, and N.H. Redingius, 1974, *Community Noise Exposure Resulting from Aircraft Operations; Computer Program Description*, Aerospace Medical Research Laboratory Report AMRL-TR-73-109, Wright-Patterson Air Force Base, Dayton, Ohio, prepared by Bolt Beranek and Newman, Inc., Canoga Park, Calif., Nov.

Schultz, T.J., 1978, *Synthesis of Social Surveys on Noise Annoyance*, J. of the Acoustical Society of America, *64*:377-405.

Speakman, J.D., R.G. Powell, and J.N. Cole, 1977, *Community Noise Exposure Resulting from Aircraft Operations: Volume 1. Acoustic Data on Military Aircraft*, U.S. Air Force Aerospace Medical Research Laboratory Report AMRL-TR-73-110(1), Wright-Patterson Air Force Base, Dayton, Ohio, Nov.

U.S. Department of Defense, 1964, *Land Use Planning with Respect to Aircraft Noise*, Report AFM 86-5, TM 5-365, NAVDOCKS P-98, Washington, D.C., Oct. 1.

APPENDIX B

COMPONENT L_{dn} CONTOUR PLOTS

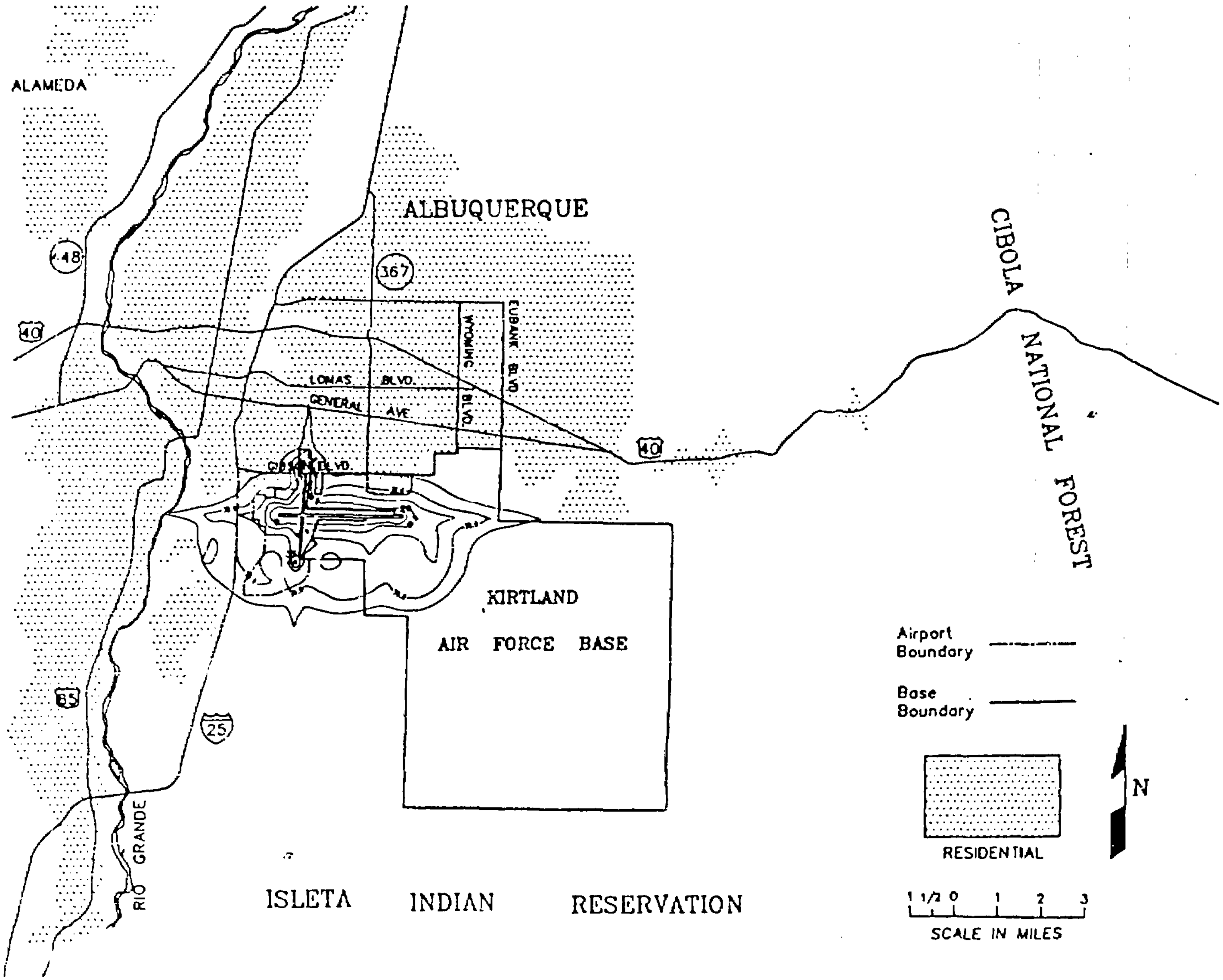

FIGURE B.1 L_{dn} Contours for Military Transient Operations (Existing and Future Scenarios)

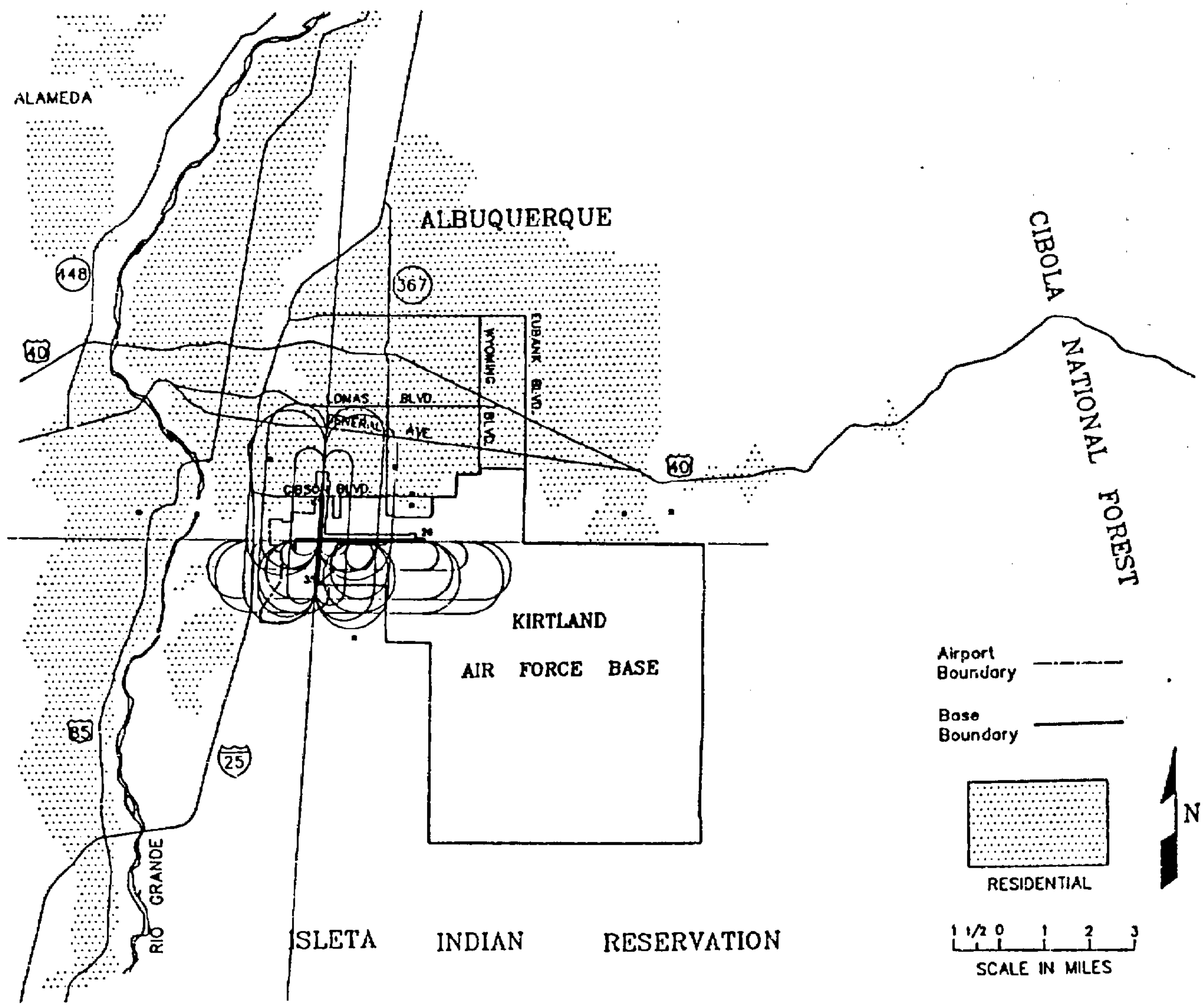

FIGURE B.2 Ground Tracks Followed by the Military Transients (Existing and Future Scenarios)

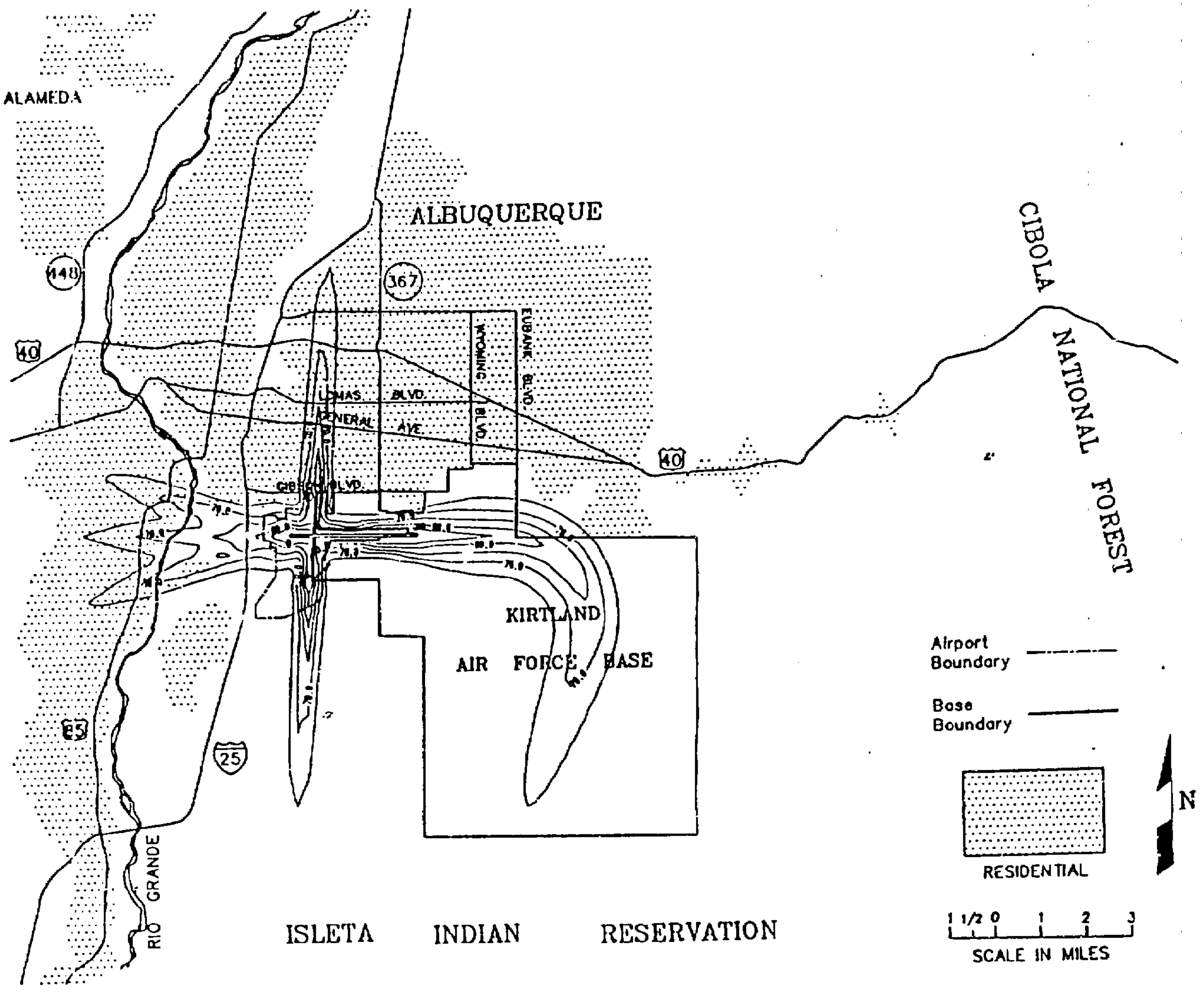

FIGURE B.3 L_{dn} Contours for A-7D Operations (Existing and Future Scenarios)

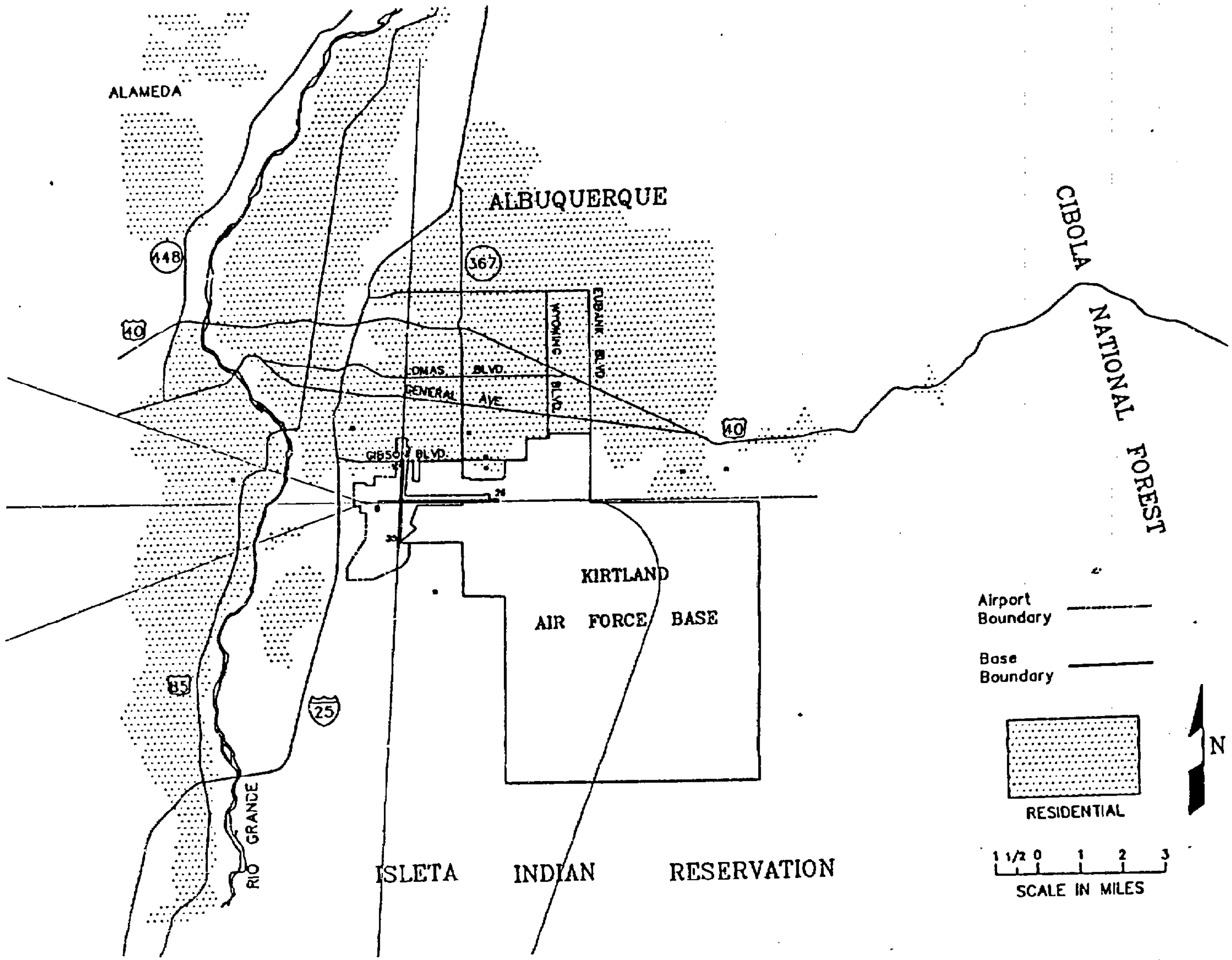

FIGURE B.4 Ground Tracks Followed by the A-7D Aircraft (Existing and Future Scenarios)

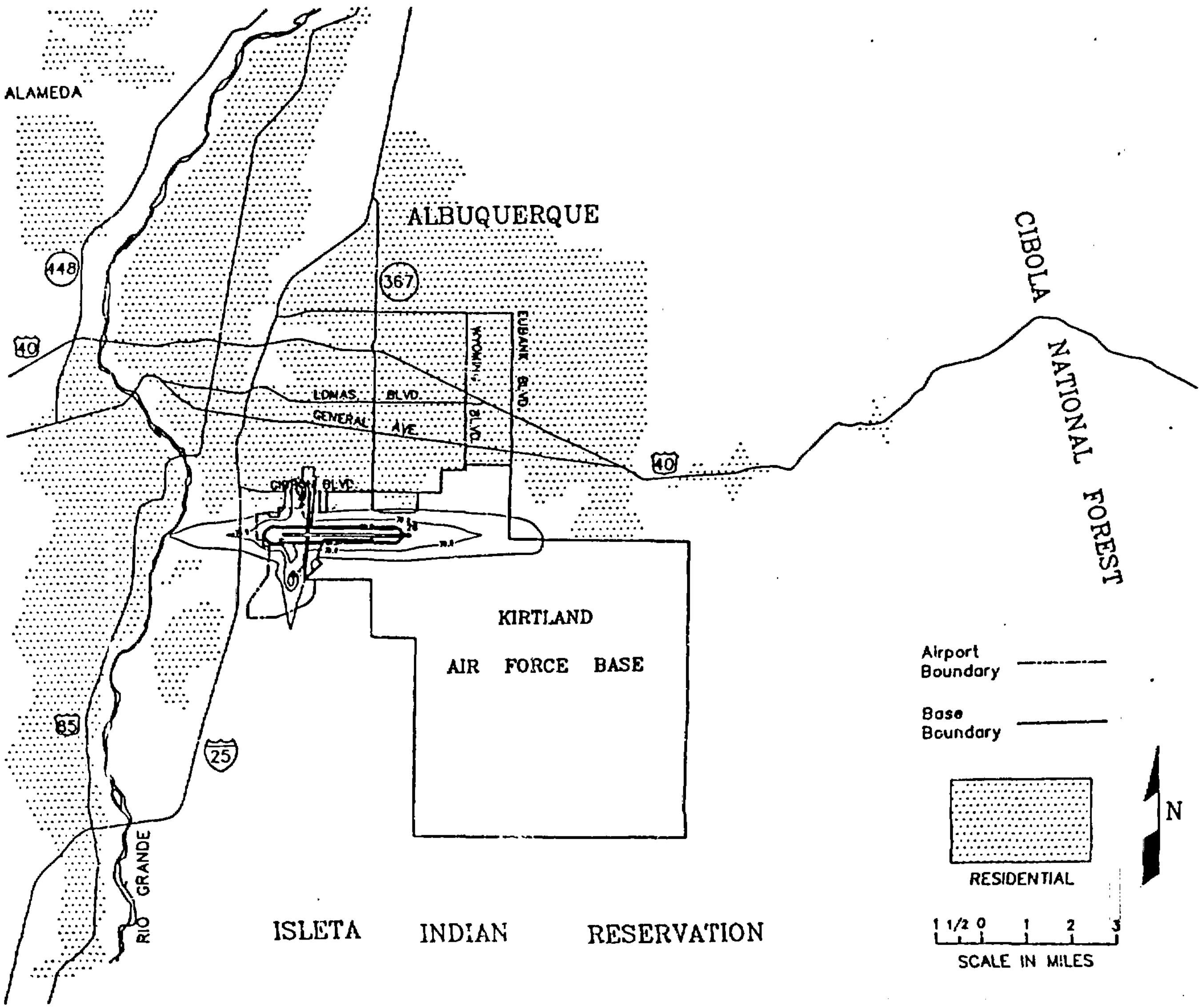

FIGURE B.5 L_{dn} Contours for Civil Aircraft Operations (Existing and Future Scenarios)

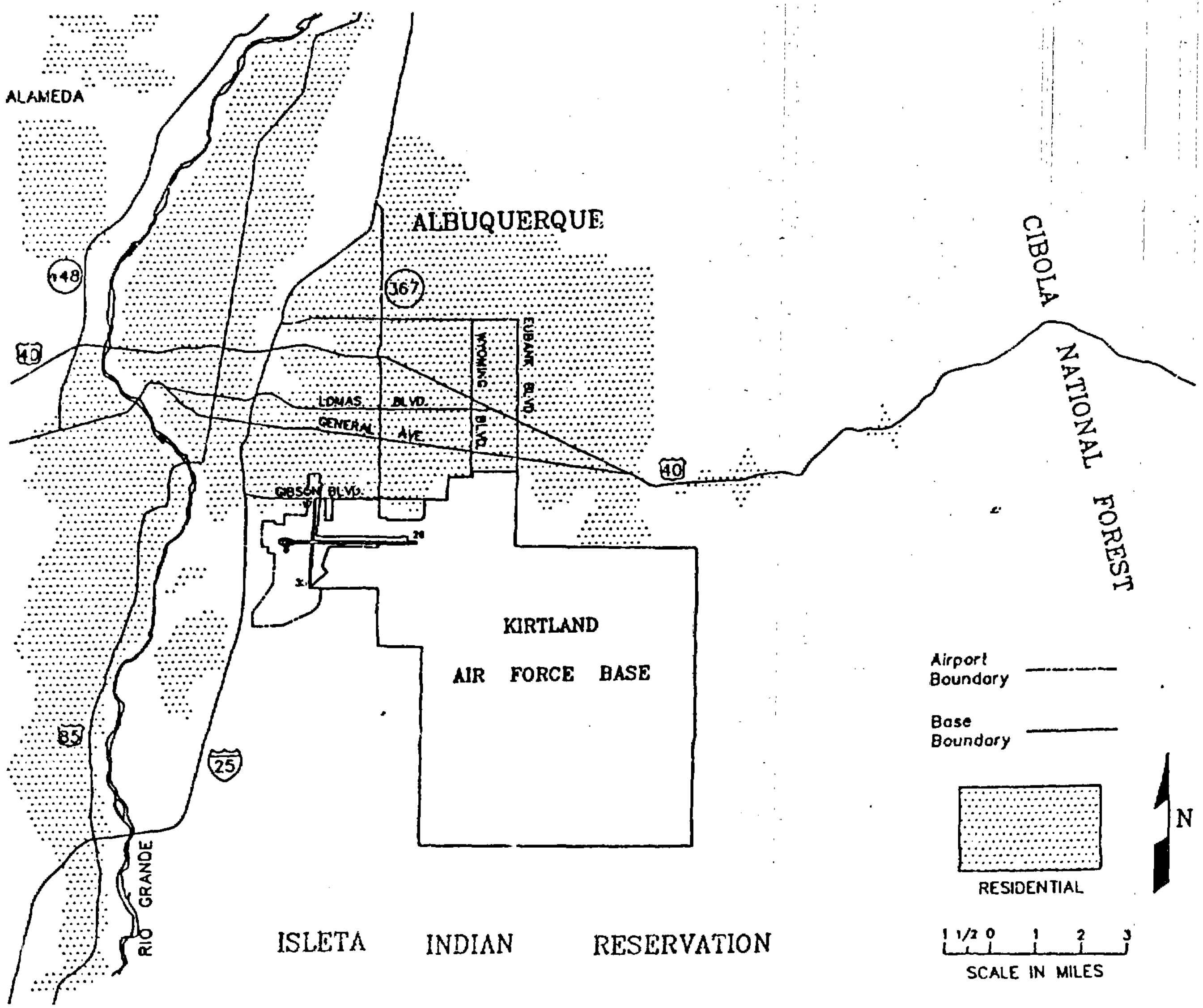

FIGURE B.6 L_{dn} Contours for Military Airlift Command C-130 Operations under the Existing (1989 baseline) Scenario Only

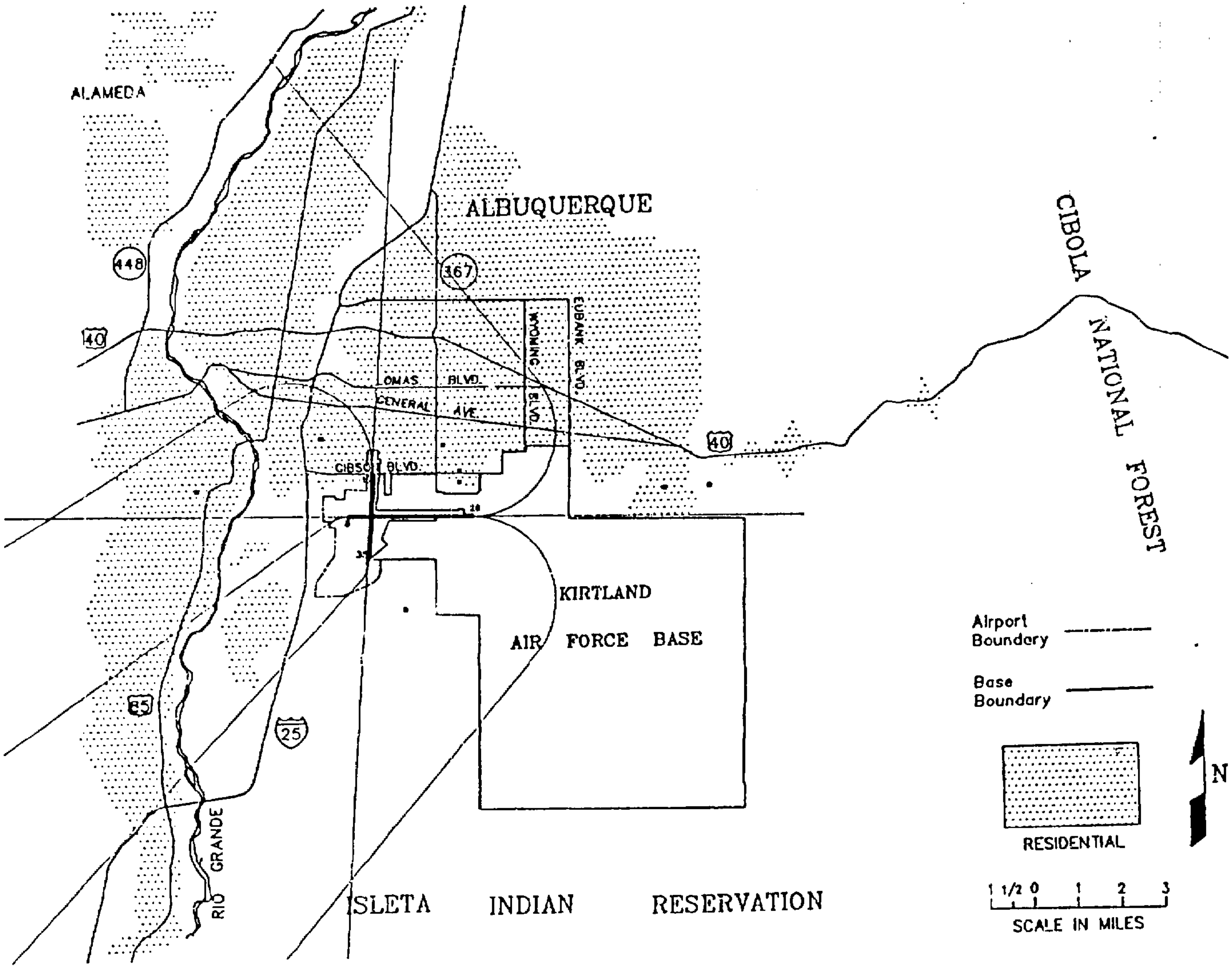

FIGURE B.7 Ground Tracks Followed by the MAC C-130 Aircraft under the Existing (1989 baseline) Scenario Only